Preliminary work on

SOUTHEASTERN BERKELEY TRANSPORTATION STUDY

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for the Claremont-Elmwood Committee,

the City of Berkeley Planning Department

and the Alameda-Contra Costa Transit District

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Material in this report does not represent policy of any cooperating agencies

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FOREWORD

Southeastern Berkeley Transportation Study

The bulk of this report contains data pertaining to traffic and transportation in the City of Berkeley. There is an emphasis on flows coming from southern and eastern areas of the Bay Area; however, much of the information contained in this report is applicable for the entire city.

Interested parties can use this report in a variety of ways. Information is arranged so that my own evaluation of the data comes first. Following this comes my conclusions in regard to the state of Berkeley transportation, and an illustrative plan of attack to meet both the specific problem which prompted this study to be undertaken in the first place, as well as a more comprehensive approach to the Berkeley transportation scene.

All of this material precedes the bulk of the report, which is the raw data I have collected. This data is grouped into broad topics and is presented so that anyone can evaulate it in any manner he chooses. I attempted to collect as much information pertaining to the subject as possible within the time available and have not had time to evaluate it all myself.

The report opens with a statement of community concern addressing itself to the problems of Berkeley transportation.

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PART I

EVALUATION OF DATA

COMMUNITY CONCERN

Residents in the Claremont Hotel Area have effectively fought an Ashby Freeway and any major street widenings since the early 1950's. Their attitude has been one of keeping the structure of their neighborhoods amenable to themselves as human beings living there, and not to automobiles, particularly those traveling through the area from outside origins for other outside destinations.

This attitude contributed to the drafting and acceptance of the Circulation Section Amendment to the Berkeley Master Plan in August of 1968. The amendment states:

> Planning for circulation in Berkeley is designed to retain the character and amenity of the City while making reasonable provision for and encouraging new methods for moving people and goods,

and:

> Berkeley will use every available opportunity to decrease dependence upon the automobile for circulation and encourage innovative experiments toward that end.

Objectives of the amendment are 1) to make circulation facilities public places by encouraging dual use for circulation and social activities, 2) to reduce dependence upon the automobile as the dominant mode of transportation, 3) to encourage a concentrated central business district and nucleated shopping centers, 4) to integrate Berkeley's regional circulation elements with those of the entire Bay Area, and 5) to preserve trees "and other amenities" adjacent to existing roadways "through use of all possible techniques to improve circulation without resorting to street widening."

These objectives translated into several principles the City should follow in transportation development. In addition to downgrading dependence upon the use of the private automobile, these include the location of major routes around rather than through residential neighborhoods, the avoidance of street widenings, the restriction of regional traffic to a limited number of city streets when it cannot be handled on existing or soon-to-be-completed freeways and rapid transit, and the preservation of existing plantings with introduction of new plantings wherever possible.

But could such an amendment be carried out in practice? The Emerson Neighborhood Group, representing an area bounded by College Avenue-Ashby Avenue-and the arterial Claremont, Belrose, Derby, Warring, immediately put the amendment to a test. This group drafted a plan to effectively block all through traffic from their neighborhood streets by diverting it onto the above-named arterials as designated in the Master Plan. They submitted their plan to the Transit-Trafficways Committee of the Berkeley Planning Commission in November 1968.

Community Concern

The Emerson Plan was in the spirit of the Circulation Amendment, which stated traffic should be diverted around neighborhoods, not through them. Yet, the arterials College, Ashby, and Claremont-Belrose-Derby-Warring were already running far over capacity with strong pressures for widening. Neighborhood streets acted as a safety valve, bleeding off some of the excess traffic. The threat of the Emerson Group to shut this valve off further aggravated the problem, and residents in the area split in their outlook on this matter. Generally, those living within the neighborhood wished to see through traffic kept out, while those living on the arterials wanted no further traffic in front of their homes. They could see no benefits for them in the Emerson Plan; only a stronger threat for eventual street widening.

This community split prompted the Emerson Group to look at the problem from a broader perspective, in order to unify area residents, all of whom were concerned with the effect of the automobile upon their residential environment. After finally gaining the closure of some streets to through traffic in May 1969 through a compromise plan, the Emerson Group decided the only final solution to the problem involved some way to reduce total automobile traffic through the Claremont Area; not just shifting it from one place to another.

The City of Berkeley Planning Department recognized that such community concern was in the spirit of the new circulation amendment to the Master Plan. It consequently agreed to cooperate with the Emerson Group and others in the area to hire a University student charged with conducting a preliminary study into the problem. This report is the result of that study.

FINDINGS

My findings derived from studying the topic and data pertaining to Berkeley transportation are presented in summary form below. This list is not complete, and others may very well come up with different interpretations of the data. But following thoughtful analysis I have concluded:

1) Automobile traffic has approached the capacity of Berkeley streets to handle it. Figure 1 shows a summary of Berkeley traffic counts for the Spring of 1969.

2) Traffic on the Claremont-Belsore-Derby arterial is among the heaviest in the City.

3) The attitude of residents is such that street widenings are not tolerable. Neither are new freeways.

4) Of the traffic on Claremont-Belrose-Derby, 25 to 30% is generated directly by the University and the Rad Lab. Much of the University-caused traffic is probably dispersed throughout the day, while Lawrence Radiation Laboratory traffic probably all occurs during rush hours. About 1600 to 2100 cars a day in each direction on Claremont-Belrose-Derby (3200 to 4200 for 24 hours) are destined to or from the main University campus. While the road in Strawberry Canyon was closed, 600 to 900 cars (1200 to 1800) in both directions) were destined to or from the Rad Lab. Now that the road "over the top" is reopened, it is difficult to tell how many Rad Lab cars continue to use Claremont-Belrose-Derby. I would guess that the number is still in the 600 to 900 range, as some Rad Lab cars from the Oakland area would also use this arterial.

5) Bay Area Transportation Study Commission data indicate that much of the rest of this traffic is destined to downtown Berkeley, with smaller amounts to the south campus area. Together with reverse flows of people living in Berkeley and driving to Eastern and Southern areas, most of the traffic on Claremont-Belrose-Derby is accounted for.

6) The total figure of 19500 movements on this arterial might be somewhat lower now because of the reopening of the connection between the Lawrence Radiation Laboratory and Grizzly Peak Blvd.

7) Of the traffic going to the University on this arterial, perhaps 1500 cars, or 3000 daily movements, have University parking permits. Perhaps another 500 cars, or 1000 daily movements, have Radiation Laboratory parking permits, although I am not as sure of the Rad Lab figure.

8) People holding these permits will be in a position to use public transportation to reach the campus once BART is open, if adequate service is provided between Rockridge Station, Berkeley Center Street Station and campus points, and if University parking permit policy in granting permits is restructured to reflect need to drive to the campus rather than academic or administrative standing as is now the case.

9) Service on A-C Transit Line 51-58 along College Avenue from Rockridge Station to the campus and thence downtown is adequate in frequency to provide shuttle service between these points during the evening, weekends and on holidays. However, it is too slow, too crowded and too indirect for campus points to provide high volume service for people who now drive during the weekdays. Additional capacity of higher quality is needed during weekdays if the University wished to encourage use of public transportation in reaching the campus.

10) Effectiveness of alternatives to the automobile in handling further increases in traffic depend both upon the quality of the alternative and upon the difficult in driving. A joint venture of providing both an auto alternative and additional road capacity to alleviate congestion is in a sense self-defeating, as many potential users of the alternative will not use it until the additional highway capacity is congested.

11) Highway congestion will occur regardless of what highway capacity is provided.

12) An express shuttle bus system connecting BART's Rockridge Station, the central University campus, and BART's Center Street Station in downtown Berkeley would require seven buses to provide a service frequency of five minutes between buses. Three additional buses would be needed if the Radiation Laboratory were included in this system. This system without additional Rad Lab service would run about 125 miles per work day.

13) Based upon Radiation Laboratory figures for its present bus service, the shuttle system mentioned in (12) above would cost about $505 per day. This cost would include $0.25 per mile for equipment servicing, $600 a month for equipment rental, and $40 per day for each of the seven drivers. This figure comes to $131,000 for a year's 260 working days.

14) The cost of providing parking spaces in concrete parking structures now runs more than $3000 per space. On a yearly basis including financing costs and maintenance, this figure comes to more than $200 for every space for every year. The cost for constructing 1500 new parking spaces would run more than $300,000 per year.

15) A-C Transit operates general bus service in the East Bay. A-C Transit is a public agency, but it is in no position to operate services at a great loss. However, it would be perhaps beneficial to the community if A-C Transit became the operating agency for such a proposed shuttle system under a subsidy situation so that the system would be coordinated not only with BART, but also with A-C Transit lines both in downtown Berkeley and on College Avenue. If there is a fare charged on the shuttle system, transfer privleges should be granted between it and A-C Transit lines.

Figure 1 a

Traffic counts in Berkeley for Spring, 1969. The road connecting the University with Grizzly Peak Blvd. was closed at this time.

1969

24 HOUR TRAFFIC VOLUMES

5,000 10,000 20,000 30,000

CITY OF BERKELEY, CALIFORNIA
TRAFFIC ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS

Figure 1 a.-2

Wilbur Smith predictions for traffic flows in 1980. These predictions were made in 1963.

20

1980
AVERAGE DAILY TRAFFIC FLOW

TRAFFIC SCALE

40,000 30,000 20,000 10,000

NUMBER OF VEHICLES

24 HOUR TRAFFIC VOLUMES

Source Berkeley Public Works Department

NORTH

0 1 2 3 4 5

MAP SCALE IN THOUSANDS OF FEET

BERKELEY TRAFFICWAY

Wilbur Smith and Associates

DATA FROM PUBLIC WORKS DEPARTMENT

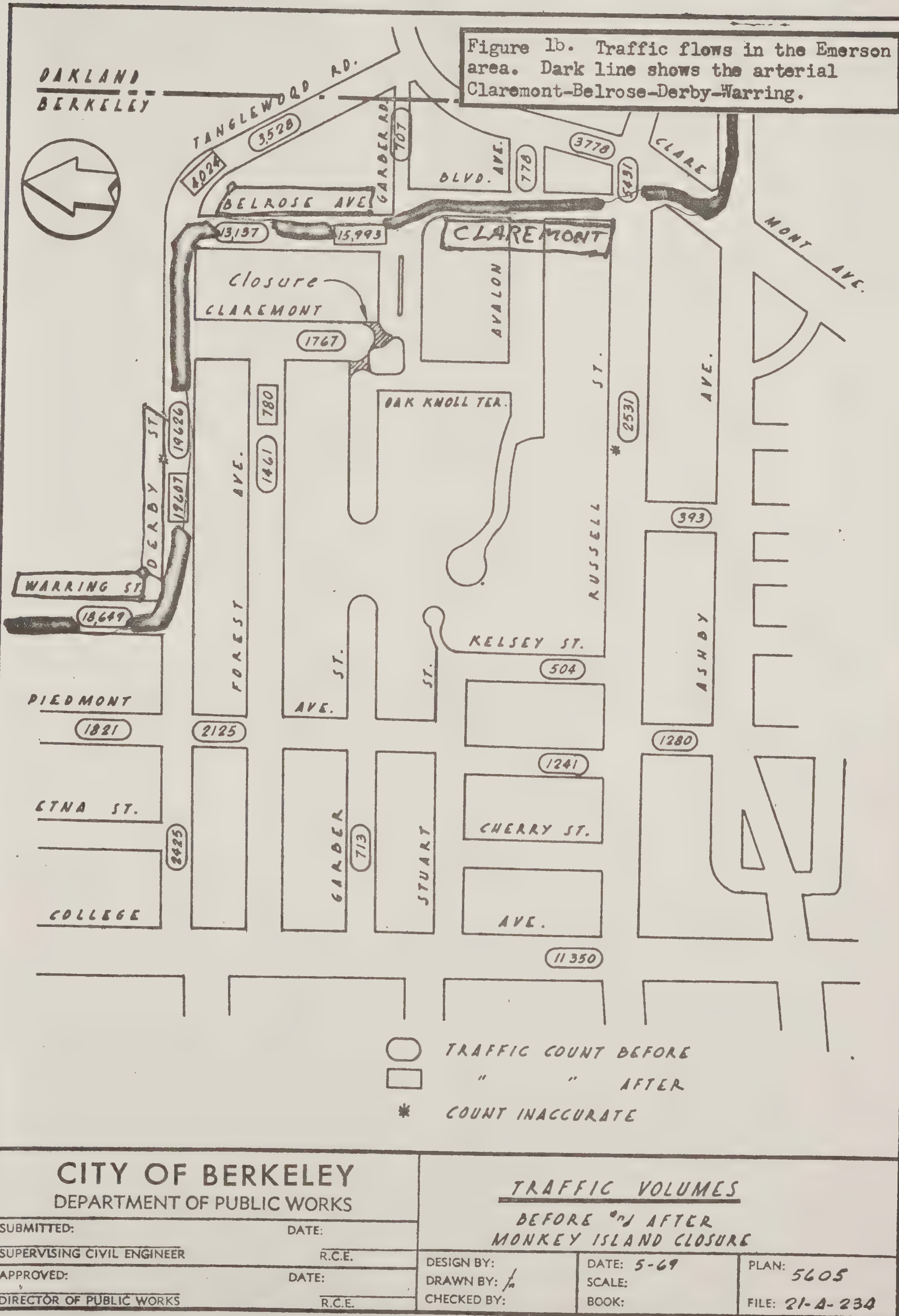


Figure 1b. Traffic flows in the Emerson area. Dark line shows the arterial Claremont-Belrose-Derby-Warring.

16) Serious problems exist in regard to access to the Elmwood Shopping Center at College and Ashby. Neighborhood people are discouraged from using the center because of difficulty in parking. Attempts at on-street parking also aggravate congestion on College Avenue.

17) A taxi service such as that now provided within the Lawrence Radiation Laboratory might be applicable to lessening the problems of the Elmwood Shopping Center. Such a service has elements similar to the developing Dial-a-Bus concept, and it would lend itself to a demonstration project if both the Shopping Center and an operating agency such as A-C Transit got together and decided to pursue the matter further.

18) Both a proposed shuttle service to act as an alternative to the automobile, and a proposed taxi service to help a neighborhood shopping center escape auto strangulation have qualities which might make them eligible as Federal demonstration projects.

19) Continued resistance in Berkeley to new freeways, similar resistance in other parts of the Bay Area and the nation, and a growing awareness of environmental problems, much of which are caused by the automobile, suggest that an alternative to the automobile be sought out to satisfy much of future urban trip demands throughout the central Bay Area.

20) The Bay Area Transportation Study Commission, although it presented controversial conclusions, has provided a Bay Area simulation model which might be useful in undertaking an on-going planning process to continually upgrade Bay Area transportation.

CONCLUSIONS

Based upon the availability of Federal funds for transit demonstration projects, the desire of some residents to find an alternative to the automobile in meeting increased transportation demands, the magnitude of the traffic problem on Claremont-Belrose-Derby as well as on College Avenue in the vicinity of the Elmwood Shopping Center, and the high cost for additional parking facilities together with the environmental blighting additional automobiles will create within the confined limits of Berkeley, several conclusions can be made.

These conclusions follow:

1) A solution to the heavy traffic on Claremont-Belrose-Derby should be in such a form to decrease total automobile usage into Berkeley. Some form of public transportation, perhaps coupled with other measures, would be involved.

2) It will be necessary to get the City of Berkeley, the University, A-C Transit and perhaps the California Highway Department together in order to work out a financial arrangement to carry this project out, as well as to arrive at a unified policy of future transportation development in this part of the Bay Area.

3) If such a policy suggests an aggressive search for auto alternatives in meeting much of the future travel demands in the Bay Area, then the simulation model porvided by the Bay Area Transportation Study Commission could prove to be a valuable asset in testing the effectiveness of various combinations of highway disutility and transit improvements. This model could contribute to a continuous transportation planning process, whereby the results of projects such as that proposed for Claremont-Belrose-Derby, together with information on new transit technology, could be fed into the computer to determine their effects on the Bay Area transportation network and Bay Area development. The computer might suggest new alterations to be made in the network. The results of these alterations could then be assessed, fed into the computer, and further improvements would be suggested. In this manner, the Bay Area transportation network would incrementally, but steadily improve in a fashion that planners wished.

These conclusions are based upon the findings which precede this section, and the reasoning behind them is more fully explained in sections that follow. Also following is an illustrative example for a possible solution to the Claremont-Belrose-Derby and Elmwood traffic problems. A different solution might be thought desirable after meetings between all interested parties, but this solution seems feasible to me within the framework of Federal funds now available.

A POSSIBLE APPROACH

TO THE CLAREMONT-BELROSE-DERBY PROBLEM

The Urban Mass Transportation Program, which was started by the Urban Mass Transportation Act of 1964, provides funds for some projects if certain conditions are met. Meeting these conditions does not guarantee a project to receive assistance, but it helps and is in fact necessary if any assistance is to be received.

A summary of the act as applied to demonstration grants is found in Appendix C.

Basically a project must have a specific objective which will add to transit knowledge and contribute to the improvement of mass transportation in relation to total transportation. The project must also fit into long range community development plans (i.e., the Berkeley Master Plan).

The proposed approach will meet these criteria. Its specific objective is to create an alternative to the automobile in getting people from the outlying areas to the campus and downtown. The reason for this approach results from the desires of Berkeley citizens to protect their environment. This desire has been synthesized into the Circulation Amendment to the Berkeley Master Plan, which states that environmental amenity comes before demands for improved automobile transportation. The plan will coordinate services with BARTD rapid transit trains as well as with A-C Transit bus service. It will also make it possible for motorists to use the service by leaving their cars in outlying areas, if that feature is deemed desirable.

The primary technique that this plan will test, other than high quality shuttle service coordinated with high quality rapid transit service, will be improved transit service to a specific area coupled with restricted, or at least not increased, auto access. A core of 3000 to 4000 trips a day (1500 to 2000 round trips) should be assured through changes in University parking permit procedures. The premise is that others will voluntarily use the service if it is of high enough quality and if auto capacity is at the same time restricted, or at least not increased.

Questions arise as to what adequate shuttle service is and how to restrict auto access. Answers to these questions will have to come out of talks between interested parties. Possibilities for the former question include increasing the capacity of A-C Transit's line 51-58 in such a way that all people boarding at Rockridge and bound for the University are guaranteed a seat. Scheduled frequency on this line is already 6 to 7 minutes between buses throughout the workday, but delays in traffic along its long route sometimes result in long gaps between buses. Also such seemingly trivial matters as the style of the bus work against this solution. Residents in the area do not like its large, cumbersome appearance, its roaring engine and billowing exhaust. Right now there is a ban on all buses on campus, and it does not seem likely that it will be

lifted for the benefit of General Motors "fish bowl" buses, which are unpopular there as well. However, such a proposal has possibilities if coordinated with a shuttle mini bus system going from the BART Center Street Station through the campus and to the Rad Lab.

Another possibility includes a more expanded shuttle bus system as shown in Figure 2. Such a system might use small 30-passenger buses on a five minute headway. Without including the Rad Lab, 7 buses would be required to provide 5 minute service over a route which is 6.2 miles for a round trip taking about 30 minutes. The bus would operate express from Rockridge to Bancroft Ave. It is shown on Claremont-Belrose-Derby rather than College to avoid the congestion on College as well as not to increase congestion by a great number of bus trips. It might turn out better to have such a shuttle routed on College, though. There are other problems with this system involving a trade off between the size of the bus and capacity to carry large numbers of passengers.

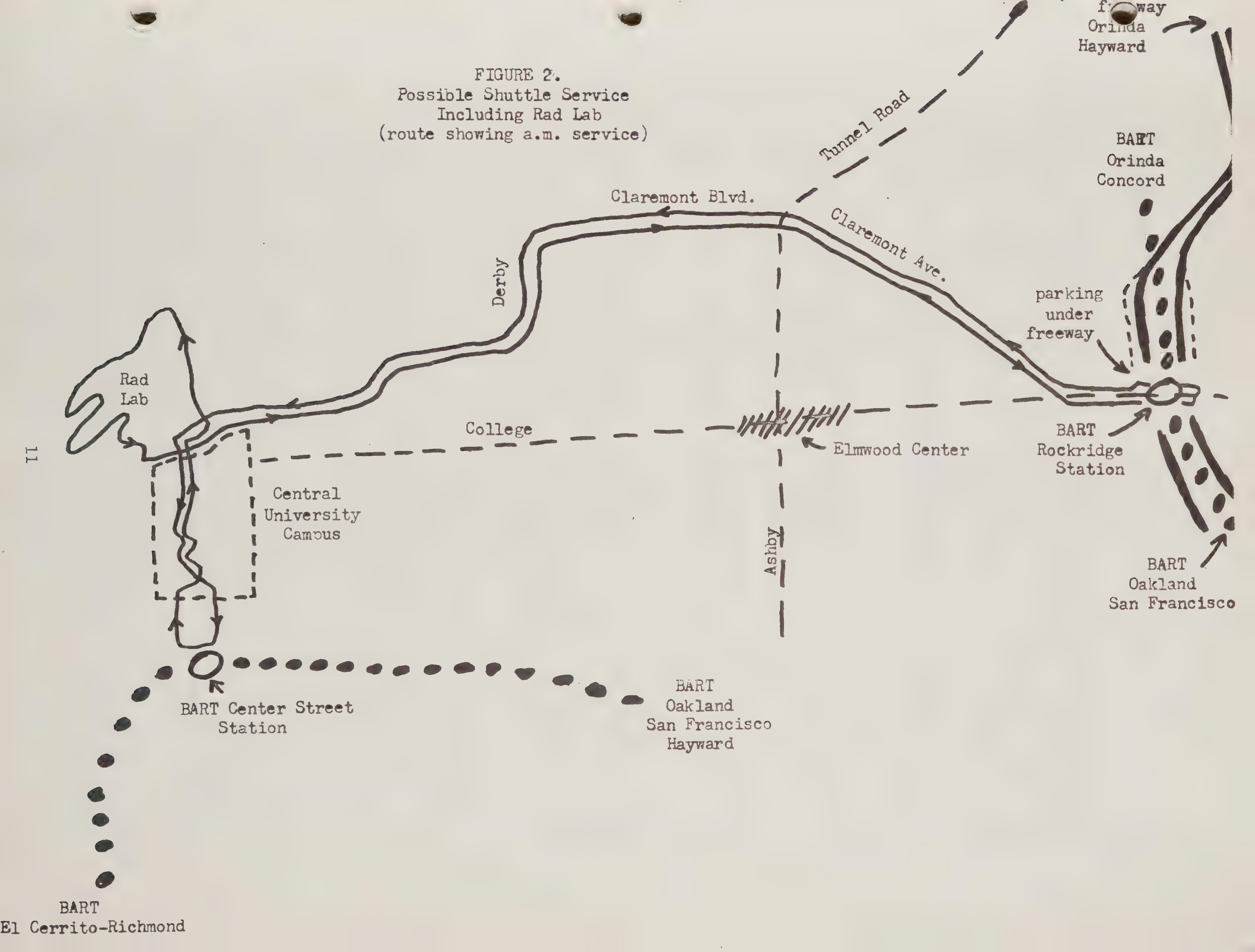
Expanded service from Rockridge to the University could take a variety of forms. These are just illustrations. The point is, however, that parking facilities are now available underneath the Grove-Shafter Freeway at Rockridge Station. These facilities will not be used by BART until mid-1972, and they are designed to have a second level added. The University could require all people living in Eastern and Southern areas as defined in Table 1 to park in this lot and use a shuttle service in getting to the campus. Better still, the University could deny parking permits to all applicants living in these areas and near BART so that they would use public transportation in getting to campus. Either policy would relieve demands upon the University parking system and would be preferable to building more parking lots, which are extremely expensive and which attract more cars into Berkeley.

In regard to restricting auto capacity, it has been suggested to close Tunnel Road. This policy would throw traffic now using Tunnel Road onto the Grove-Shafter Freeway. Of the 19500 trips on Derby in the Spring of 1969, 3500 could probably be diverted into transit from Rockridge Station to the campus through campus parking policy. These people would either exit the Grove-Shafter Freeway at College and park their cars, or they would take BART to this station (or to the Center Street Station if from Southern Areas).

Of the 19500, another estimated 2400 trips were caused by employees destined to or from the Rad Lab. These employees could also be encouraged into transit or to drive over the top of the hill via Grizzly Peak Road. Many of them reportedly now do the latter since Strawberry Canyon Road has been reopened following storm damage.

Finally, of the 19500 daily movements on Derby, perhaps 2000 are caused by local traffic. All of these subtractions from the 19500 figure leaves about 12000 daily movements going onto other streets. These cars would attempt to use College, Claremont Avenue and the Claremont-Belrose-Derby arterials, Telegraph Avenue and Shattuck Avenue in reaching the campus, south campus and downtown areas.

FIGURE 2.
Possible Shuttle Service
Including Rad Lab
(route showing a.m. service)



Closing Tunnel Road would not make it easier to drive to the campus. On the other hand, it would still be possible. What it would accomplish would be to take the bulk of traffic off Ashby, much of it off Claremont-Belrose-Derby even considering cars cutting back up Claremont Avenue, and put it on streets more able to handle it (except for College). Claremont-Belrose-Derby is designated only as a temporary arterial in the Master Plan.

It would also cause many people to voluntarily either park their cars at Rockridge and take the improved service to the campus, southside or downtown, or take BART to Rockridge Station or Center Station and then do the same.

This report has not concentrated on problems of the Elmwood Shopping Center at Ashby and College. These problems include inadequate parking, extreme congestion on the streets discouraging people from attempting to drive and park at the Center, and still added congestion caused by people trying to park on College Avenue.

Nevertheless, this area appears ideal as the site for a Dial-a-Bus demonstration project. Such a project could be tested to remove curb parking spaces, increase business in the center, and decrease local auto usage.

It could also be tested as a feeder service to arterial bus lines. Heavy arterial bus lines such as the line 51-58 on College Avenue have to stop very often, as people don't like to walk very far. It is conceivable that if Dial-a-Bus is successful, it could be used to pick up and deliver people from their homes in an entire area to stops on a frequent, limited arterial line. Stops would be spaced approximately ½ mile apart, allowing bus speeds to equal that of regular traffic flow. Dial-a-Bus, if successful, would provide passenger distribution functions.

On the 51-58 line, for instance, stops might be located (after BART is in operation) at Rockridge Station, College and Alcatraz, College and Ashby, and at Bancroft. If Dial-a-Bus is successful, improved sub-regional service would be provided to large areas on both sides of College, although service for people living right on College between stops might be deteriorated. In addition, local service for shopping and recreation by public transportation would be provided. This type of service is not now available.

If it is impossible to get a demonstration for Dial-a-Bus to come to this area, or before that time, a taxi system such as that now operated at the Radiation Laboratory might be tried. This system, as explained later in this report, is in essence a crude Dial-a-Bus system. It could be used in the same manner as Dial-a-Bus, but on a much more limited scale. However, more information needs to be known in regard to the number of people from local areas going to the Elmwood Center on a typical day. I have not collected such data.

Both of these projects together or either by themselves will furnish information for improved integrated East Bay transit. One project, an

improved and adequate service between Rockridge and the University designed to handle at least 3000 people a day (and more than 6000 a day from the Center treet Station to campus, if estimates made by Homburger are correct) will provide information on the feasibility of forcing some people out of their automobiles through good service and restricted road capacity. The other project, some type of Dial-a-Bus demonstration centered on the Elmwood district, would test the feasibility of reducing some degree of local automobile traffic. It could also test the feasibility of replacing the feeder characteristics of arterial lines, so that these lines could be speeded up significantly, as well as be made to serve better a larger geographical area.

That such information is desirable is shown by sentiment in the Claremont-Elmwood Group and seemingly rising concern about environment throughout the Bay Area. It is also shown by the intent of the Master Plan, which states:

> Berkeley will use every available opportunity to decrease dependence upon the automobile for circulation and encourage innovative experiments toward that end.

Such information would also be useful to other cities in this country, and for that reason there is a possibility of getting Federal funds to cover much of the cost of conducting these projects. However, these projects cannot come to fruition without the joint cooperation of the City of Berkeley, neighborhood groups, A-C Transit and the University.

The support of the University is particularly needed. The community must explicity and clearly state its position to the University and make the University understand that the community is looking for means of getting personnel to the University other than through more parking structures, more cars, more smog and more roads. The community, if it wishes to pursue alternatives to the automobile, must:

1) Gain the attention of the Campus Planning Committee;
2) Be granted a hearing before that body, and before the Chancellor;
3) Persuade that body of the community position.

This approach naturally assumes a solid front of City-Neighborhood support.

The support of A-C Transit is also needed to insure that any new services are coordinated with existing A-C services, that findings are available to A-C, and also to provide the technical assitance necessary to carry our such projects under Federal funding. It may or may not be advantageous to have A-C Transit operate a shuttle system. The University is not bound by restrictive labor practices.

But the support of the University is needed first.

REASONING BEHIND CONCLUSIONS

Uncertainty in regard to BATS figures on school trips somewhat clouds the results of the data. Nevertheless, even with school uncertainty we can say that less than half of the traffic on Claremont-Belrose-Derby is caused directly by the University. On the other hand, we can say with almost equal certainty that more than 20% of the traffic is University-caused. The figure probably lies in the range of 25% to 30% of the 19500 daily movements.

Furthermore, with approximately 2000 University parking and fee lot permits issued to people in eastern and southern areas, a maximum of 4000 vehicle movements can be regulated by University parking procedures. There is also the potential of another 700 or so permits being regulated by the Rad Lab. The maximum assumes that everyone with a parking permit comes to and leaves the University every day, and that each parking permit represents a vehicle movement rather than a person movement. Four thousand movements regulated by parking procedures represents 21% of the 19000 daily movements on Claremont-Belrose-Derby. Three thousand daily movements regulated by parking (1500 permits per day), represents about 16% of the total.

The question is, what to do about it? A smaller percentage of the traffic than expected appears to be caused by the University. The problem is not as neat as originally expected.

Much of the traffic comes from one place, Tunnel Road. A substantial amount, 25 to 30% goes to the University. Another large segment appears to go to the CBD, with still another large segment to the South Campus area. All of these areas together, including trips originating within the area and traveling outside, seem to account for the bulk of the traffic on Claremont-Belrose-Derby.

Residents of the Elmwood and Claremont areas want this automobile traffic out of their areas. They have explicitly stated that any street changes made to facilitate automobile traffic flow will result in a further degradation of their environment, the quality of which has already been lessened by heavy auto traffic.

Several Alternatives

There are several approaches the Elmwood and Claremont groups can take to cope with traffic flowing through their neighborhoods. Some of these involve just shifting the problem from one area to another, while others are approaches to a real solution. Because similar problems and sentiments are rising elsewhere in the Bay Area, I recommend that the group push for an alternative which will lead to a final solution.

One alternative is to build a new road, either via a new tunnel behind the University, or via a route using Piedmont to Dwight, up Dwight alongside the School for the Deaf and Blind, and thence on a new alignment across the school to connect with Tunnel Road on the grounds of the Claremont Hotel, intercepting Fish Ranch Road in the process. The latter route is

by far the less costly to construct, and if a new road were to be constructed, this would probably be the route chosen.

Unfortunately, this solution would take some homes with it, and the creation of such a new thoroughfare in Berkeley just to accommodate the automobile while at the same time doing environmental damage is not in the interest of the group, nor is it in the spirit of a seemingly rising tide of anti-auto improvement sentiment throughout the central Bay Area.

Another alternative is to find some way to absolutely decrease auto usage into Berkeley via this corridor. This alternative assumes getting people into public transportation for at least the last part of their trip into Berkeley. This alternative is very challenging, as it traditionally has been difficult to get people out of their automobiles. On the other hand, it is the only real solution to the problem, given the pattern of development in Berkeley.

Indication of Need for a Full Solution

The Claremont-Elmwood people are not the only people who have expressed a preference for their environment over automobile amenities when a choice has come between the two. Such sentiment has been cropping up throughout the Bay Area. Witness the San Francisco freeway revolt beginning in 1959, continued resistance to an Ashby Freeway, and particularly the recent strong reaction against the BATS report, first issued in May 1969. Such rising sentiment suggests that shifting a problem such as that on Claremont-Belrose-Derby from one area to another without looking for a final solution will not work.

The BATS report in fact shows what will happen to the Bay Area in terms of new freeways with implicit increases in smog, parking lots and sprawl if no alternative is found for a significant portion of future auto traffic. If in fact Bay Area residents do not want these dire predictions of BATS to come true, what is needed in the way of an alternative?

Public transportation is an alternative to the automobile which has not worked well in the past. It is also an alternative which is expensive to the public pocketbook. However, public transportation is the only alternative there is to freeways without lowering densities. Some way must be found to make it suitable in solving travel demands in the Bay Area without hindering economic activities.

Fortunately, the Federal Government is putting new money in transit research and development, which holds some promise for the Bay Area, and means already exist to test the many ramifications of progressive improvements in the transit "system" here.

A solution to the Claremont-Elmwood problem could be so designed as to be the first and immediate step in a planning process to bring

into being a viable auto alternative to the entire central Bay Area.

The Nature of Transit

To make any recommendations in auto alternatives or transit improvements, we should know the nature of the substance we are working with. Following is a discussion of transit, which sets the groundwork for a recommended plan of action.

Relative Quality to Auto--If there is a given amount of traffic and two ways of moving it, the automobile and transit, whether the traffic will move by auto or transit is determined by the relative difference in quality between them. "Quality" here is an all-inclusive term including all aspects making transit or auto travel either desirable or undesirable.

Transit is traditionally of low quality as compared to the automobile. But one way that has occured in narrowing this quality gap involves lowering the quality of automobile travel. This has occured by increasing congestion, increasing difficulty in parking, making it more costly to park, raising tolls and other means. If at the same time transit quality improves and is not too expensive, the quality gap remarkably narrows. It narrows to the point where a substantial number of people make a free market choice to use transit.

This process can be observed on corridors leading into San Francisco. Over the past ten years auto congestion has greatly increased, parking is difficult to find, and in the financial district costs $2.25 per day. At the same time, the Bay Area transportation system, such as it exists, focuses on San Francisco. It is very easy to get to downtown San Francisco from most parts the East Bay by public transportation. And since 1960, quality has steadily improved with more comfortable equipment and better schedules. The result is that people using buses to cross the Bay Bridge has increased from 20,000 per day in 1959 to 30,000 per day in 1965. More people use buses than autos to get from Berkeley to the financial district of San Francisco. BATS reports that in 1965 8853 transit trips went from Berkeley superzone 17 to San Francisco superzone 1 on a typical work day, as compared to 3133 vehicle trips.

So it appears that once a certain level of congestion is reached, and there is alternate transit service available of reasonable quality, then auto users will begin to switch from auto to transit. If it is desirable to move a large number of people by transit, then the way to do it, after making sure that good transit is available, is to have a limited highway capacity. Then congestion would set in with only a low volume of auto traffic. If it is desirable to move the bulk of people by highway, then the way to do it is to have large highway capacity. But, as the BATS report makes amply clear, travel demand is such that congestion will set in no matter what capacity is available. Auto congestion is unavoidable. It is just a question of how much traffic you want to move by auto that determines what highway capacity you want.

And if you decide that too much environmental damage results from a fantastically large highway capacity, then you had better plan for a good transit alternative to satisfy trip demand. Otherwise, there is danger that economic activity might move to other regions with fewer restrictions on circulation. This is more or less the argument of BATS.

Different Concepts in Transit-- It is often assumed that transit is all alike in all cases; that there is one alternative to the atuomobile--transit--and that this alternative is ineffective. This notion is misconceived. The total transportation picture can be considered in many different ways, and the one term "transit" can assume many different aspects. But ever since transit became unprofitable as a private venture, all of these aspects assume some notion of "public good."

Following is a list of three ways of which transit could be thought:

1) In its most limited role, transit is thought of as a social service for the very young, very old, crippled and those too poor to own cars. As in all social services where just the barest minimum is doled out, transit service in such cases allows only the most limited and restricted movement. It is also very expensive to use, as it is felt either explicitly or implicitly that only those who have absolutely no other alternative should use it, and that these users should pay as much of the cost as possible. These "systems," because of low costs, low usage and high fares, sometimes operate with the smallest deficits. Los Angeles, in fact, offers the example of a profitable operation.

2) In a larger role, transit is thought of as a necessity for city survival. Among such systems are commuter-oriented operations, designed to bring large numbers of office workers into central cities in a short period of time. Without such systems, these central cities could not survive with their same high density activity and particular way of life. These transit systems are more highly regarded than those described in (1) above, and if necessary, subsidies readily come forth to keep fares at a low enough level to ensure high ridership during peak periods. As mentioned earlier in this section, these are periods when the relative quality of automobile travel drops to approach that of transit, which has risen because of more frequent service at times when many people want to travel.

3) An expansion of (2) above is a region-wide network system offering the same level of service to all parts of the region from all parts at all times of the day as (2) above offers to the central city during rush hours. Such systems exist for the same reason as those described in (2) exist--for region survival with a particular way of life and environmental amenity. However, in this case population pressures and income have risen to the point where a predominance of auto use to meet all trip desires for the entire region jeopardizes its existence. As in (2), rising auto congestion and increasing expense in parking result in falling quality of auto transportation.

In reality, most systems existing today are combinations of (1) and (2), with perhaps a small component of (3). There is at this time no region existing with anything approaching a complete (3) system, primarily because present transit technology and economics will not allow frequent or fast service to any place but the CBD, where a large number of people want to go throughout the day.

Present Transit in the Bay Area--The East Bay at this time operates a system which is largely a commuter-based operation centering on San Francisco, with a lesser reliance on Oakland. Service within San Francisco approaches the (3) category, but there is nothing approaching that on a région-wide scale. Local service within the East Bay is designed both as a feeder service to transbay commuter and East Bay express lines, and also as a limited social service as described in (1).

BART will greatly improve service for parts of this system and extend its effects to new areas, enabling them to send people to San Francisco and Oakland to work. But it will not in itself greatly alter the character or emphasis of the system. In its first stage, BART will improve possibilities of intra-regional travel to places other than the CBD, but it will do less to offer a complete range of intra-regional travel choices. Consequently, in making future projections of present systems, BATS predicts that the Bay Area transit system will provide for only a small fraction of the total Bay Area trip movements; namely, commuter traffic to the central CBD's. (See Appendix B.)

In a new publication on urban transportation problems put out by the U.S. Department of Housing and Urban Development (Tomorrow's Transportation: New Systems for the Urban Future), there is recognition that something approaching a (3) type system is necessary to be effective on a regional level:

> No matter how sophisticated the technology, transit which operates without some sort of network service pattern almost certainly will remain a marginal service in the movement of urban population. (p. 62) Without a network of guideways the system could hardly avoid conventional heavy dependence on work trips and a radial orientation to existing central business districts. Thus, it could not provide adequate transportation alternatives in large metropolitan areas with a wide dispersion of trip origins and destinations. (pp. 61-62)

Yet BATS never assumed the existence of a future network system in making its analysis and predictions for the Bay Area. It assumed only a system with a radial orientation to existing central business districts.

Does the Bay Area need a (3)-type system? The sentiment of the Claremont-Elmwood group, the freeway revolt in San Francisco and the reaction to recommendations of the BATS Report indicate that, yes, that time is approaching. BATS recognizes that with tight restrictions on available space and increasing urbanization a much greater emphasis on transit will be required (pages 8-9). But increasing cries against freeways and against sprawl did not seem to indicate to BATS that that day might be now. Now is the time to start planning for a viable auto alternative.

Reasoning Behind Conclusions

A Plan for Action

No (3)-type system exists anywhere at this time on a regional scale. There are no examples for the Bay Area to follow and few experiences to learn from, although these are increasing. Wonders could probably be done with existing technology and the start which BART has provided, but new technology is probably also needed to provide an effective alternative to the automobile. Thus, any attempt to set up a comprehensive auto alternative will involve unknown risks on success and effects on Bay Area development.

The BATS model as explained in Appendix B could serve as a central block in the development of an auto-alternative planning process. Properly used, the BATS model could simulate the effects upon the Bay Area of various combinations of comprehensive transit networks and of various highway systems, incorporating differing amounts of disutility. Better use of existing technologies and assumptions about use of new technologies could be tested. Many uncertainties could be eliminated using such simulations.

But as amply illustrated in the summary of the BATS Report (Appendix B), any simulation coming out of a computer is only as good as the assumptions and hypothetical systems going into it. More needs to be known concerning consumer reaction to differing combinations of services available.

This report suggests a two-pronged attack upon the problem of arriving at a viable auto alternative. The first prong involves the execution of a number of carefully observed projects to test consumer reaction to various mixes of service on a small scale, as well as cost characteristics of various types of service.

A solution to the Claremont-Elmwood problem could serve as the first one of these projects. Suggested projects, which are explained further in following sections as time permits, are presented below:

1) Closure of Tunnel Road just north of the junction of State Highways 13 and 24. Attempts to divert as much of this traffic into shuttle service to the University and downtown as possible, while diverting the rest of the traffic onto Telegraph and Shattuck via the Grove-Shafter Freeway. Shuttle service should be so arranged that people either driving or using BART to Rockridge and Center Street Stations could make use of it. Such a closure should also be coupled with a change in the method of allocating University parking permits and certain restrictions on University parking. Data should be carefully recorded on all results of this closure and related works to be later analyzed by computer.

2) Integration of Rockridge Shuttle, Center Street Station Shuttle, Radiation Lab Shuttle and perhaps Fernwald Dorm shuttle into one integrated system offering quick access to all parts of the campus from and to outside connections.

3) Draft plans for institution of a dial-a-bus demonstration project centering on the Elmwood Shopping Center, Claremont Hotel and perhaps

Rockridge or Ashby Stations. Attempt to get Federal funds for this project as one step in a larger transit network. Dial-a-bus might also be tested as an alternate to a shuttle from the Rockridge Station to the University. Different operating patterns should be programmed into dial-a-bus's computer.

The second prong involves the formulation of an auto-alternative system on paper. This system would serve as a test model for the BATS simulation study. This system would incorporate existing technologies and would essentially use AC Transit restructured around BART and traffic demands as revealed by BATS flow figures as a base. At first existing knowledge and assumptions about transit characteristics and consumer reaction to them would have to be used in formulating such a system. However, feedback from the previously mentioned projects and also new technologies and findings developed elsewhere would be incorporated into the system as these became available.

Additional projects to aid in the formulation of this plan would involve more extensive alterations of the existing transit structure. But they would be performed in the same vein of anticiapted improvements coupled with additional data on consumer reaction and service costs. This information would act as feedback into the test plan. Feedback would suggest changes in the structure of the test plan, reflecting new conditions or new information. These changes, once tested, might suggest further changes in the operating system, with more feedback, etc.

Suggested additional projects include:

1) Study of AC Transit routes and Berkeley School routes in relation to figures on from where to where people want to go as determined by BATS. Possible restructuring and integration of routes, particularly in local Berkeley routes which might better serve the University as well as downtown and regional transit feeder services.

2) With the introduction of BART, differing fare and payment plans should be tried on an experimental basis.

3) A more extensive restructuring of AC Transit service in light of results from tests on the hypothetical paper network. This restructuring would act as the embryo system, which through a continuing cycle of feedback, change and feedback, would gradually evolve into the auto alternative.

All of these proposals should be tied together into a coordinated package, or which the execution of each proposal would be one step in the direction of an integrated system of regional, sub-regional and local transit which will evolve into an effective alternative to the automobile. This package might make it easier to obtain funds from the Federal government for the execution of specific proposals.

PART II

PRESENTATION OF DATA

ORGANIZATION OF DATA

The major concern of this study has been the arterial Claremont-Belrose-Derby-Warring, running through the southeastern part of this city. Any solution to the problems which heavy automobile traffic generate on this arterial will require a knowledge of several factors. These include:

1) Traffic flow data and analysis;
2) University parking policy;
3) Transportation facilities now available in Berkeley;
4) Possibilities for new facilities and the manner in which new facilities could affect the traffic situation.

Within the time available, I attempted to explore these several factors. Following is a presentation of data relating to these topics. Also, since traffic problems in the Claremont-Elmwood area have effects that reach into other parts of the city, and because any policy pursued to eliminate problems in this area might also apply to other parts of the city, much of the following data is applicable to the entire City of Berkeley.

TRAFFIC FLOW DATA AND ANALYSIS

Berkeley Department of Public Works' traffic counts for the spring of 1969 (see Figure 1) show traffic flows on the Derby section of the Claremont-Belrose-Derby arterial to be in the neighborhood of 19,500 vehicles for a typical weekday 24-hour period. This figure might now be somewhat lower, as the road up Strawberry Canyon has been reopened. However, the question still arises: How much of this traffic is directly caused by the University?

One method of attack is to determine the potential regular traffic that the University could generate. The approach to this method involves finding out how many students, faculty, and staff live in areas that would likely cause them to use Claremont-Belrose-Derby in reaching the University. This approach should give an idea of the magnitude of University-caused traffic on this arterial. Other estimates on traffic flows, such as those made by the Bay Area Transportation Study Commission, could be used to check the first estimate.

Data that might be useful in analyzing flows on Claremont-Belrose-Derby came from several sources. These included the Student Directory, 1968-69, University of California parking records for 1968-69, Bay Area Transportation Study Commission estimated figures on flows between analysis zones for 1965, City of Berkeley Public Works Department figures on traffic counts, and talks with various officials.

I also hoped to get a print-out of all addresses for faculty and staff for 1968-69, but as of this date the print-out is now available. This print-out would give me the same information for faculty and staff as the Student Directory gave me for students. However, because of its absence, estimates explained below were made for faculty and staff.

All of the above data were analyzed quite specifically in regard to the Claremont-Belrose-Derby arterial, except for the extensive data obtained from BATS. This data is useful for a much larger area, and hopefully will be used on a larger scale.

Data from the Department of Public Works (see Figures 1a and 1b) revealed total flows on the artery in the neighborhood of 19,500 vehicles per typical work day. The remainder of the data was used to determine how much of this traffic is generated by the University.

The basic approach was to determine how many people going to the University--students, faculty and staff--lived in areas that would likely cause them to drive on this artery if they chose to drive to the University. I then made an estimation as to what proportion of this figure would drive to the campus on a typical day, and compared the result with BATS estimates on flow figures.

As explained in the sections presenting student and parking data, I considered all persons working or studying at the University and living in communities in Southern or Eastern areas as defined in Table 1 to be likely candidates for travel on the Claremont route. It also seemed to

me that people living in certain portions of Oakland and Piedmont would also travel on this route, but just from addresses alone, I could not easily differentiate as to where people lived within Oakland. So the Southern Zone extended from the Oakland-San Leandro line to the south. In Figure 5, this zone is shown as South Zone III.

Considering the BATS data, however, I was able to differentiate by analysis zone traffic flows from different parts of Oakland to different parts of Berkeley. I therefore added South Zone II, also shown in Figure 5, to include additional people traveling to the University who would also be likely to travel on the Claremont Route.

University Residence and Parking Data

Student Residence Data--Using the student directory for the fall of 1968 I separated all those found living in eastern Contra Costa towns, hereafter called the "East Area" and those living in southern Alameda towns, hereafter called the "South Area III" from the bulk of the listings and considered them suitable for consideration as potential commuters on the Claremont route. Eastern and southern towns are defined in Table 1.

Table 1. Definition of Eastern and Southern Communities

Eastern Communities (East Area)	Southern Communities (South Zone III)
Orinda	San Leandro
Glorietta	San Lorenzo
Walnut Creek	Castro Valley
Moraga	Hayward
Alamo	Union City
Danville	Newark
Concord	Fremont
Diablo	Decoto
Lafayette	Centerville
Pleasant Hill	Niles
Pacheco	Alvarado
Martinez	
Livermore	
Pleasanton	

(For the few students living in the Livermore-Pleasanton area, only those with non-physical science majors were considered, because of the nuclear facility there.)

Because of the large number of listings for students (approximately 28,000), this data was analyzed on a sampling basis. All listings were considered for several letters of the alphabet chosen at random. The group of listings were then broken into samples.

Traffic Flow Data and Analysis

Because a larger number of listings were analyzed for students living in the eastern area than in the southern area, there are a larger number of samples for the eastern area than for the southern area. Table 2a contains a summary of the number of eastern and southern students found in each sample. Appendix contains the statistical analysis for this data.

Table 2a. Percentages of Students Living in Eastern and Southern Areas

Sample	Sample Size	Students from East	Percent of Total
	Eastern Area		
1	432	6	1.39
2	432	7	1.62
3	432	7	1.62
4	432	17	3.94
5	432	9	2.08
6	432	13	3.01
7	432	8	1.85
8	489	14	2.86
9	216	4	1.86
10	432	10	2.31
11	432	9	2.08
12	432	10	2.31
13	432	8	1.85
14	199	8	2.49
			31.27
Eastern Area Mean:	2.23%		
	Southern Area		
1	432	4	0.93
2	432	5	1.16
3	432	4	0.93
4	432	5	1.16
5	432	8	1.86
6	432	2	0.46
7	432	4	0.93
8	489	4	0.82
			8.25
Southern Area Mean:	1.03%		

Using a Student's T statistical test as shown in Appendix A to test the hypothesis that the mean percentage for the entire student population is the same as the mean of the 14 samples, we can say with 95% confidence that between 2.83% and 3.69% of the student population lives in eastern and southern regions.

With a higher confidence of 99%, this range increases. With 99% confidence, we can say that between 2.66% and 3.88% of the student population lives in these regions.

Assuming a student population of 27,000, these confidences result in:

95% level: 764 to 996 students in these areas.
99% level: 718 to 1048 students in these areas.

It would seem safe to assume a figure of 800 with these confidences. Also, because of the location of most of these students away from transit lines, it would seem probably that if these students came to campus every day, they would drive, probably using the Claremont-Derby artery on the last leg of their trip.

Where University Parkers Live--The University Parking Office keeps a complete file of permits for both regular and fee lots. Each permit has the applicant's home address written on it, so it is possible to determine from which areas applicants would drive in order to reach the campus.

The files for 1968-69 were complete when I visited the office in July of 1969, so those were the records I used.

Parking permits (as opposed to fee lot permits) were contained in six file boxes plus, I would estimate, three quarters of an additional file box. I sampled two complete boxes, one of which contained 594 permits, excluding residence hall permits, and the other of which contained 685 permits, excluding residence hall permits. Multiplying the average of these two numbers by 6.75, I estimated there were approximately 4500 total parking permits.

The results of sampling two file boses with a total of 1279 permits (not including residence hall permits) are presented below in Table 2b. The category "other" includes disability permits, courtesy permits, permits for night employees, and instances where the applicant did not include his address.

Table 2b. Where Parking Applicants Come From (Sampled 12/9)

East Area[1]	139	10.9%
South Area III[1]	19	1.5%
Berkeley	520	40.8%
Oakland	146	11.4%
Richmond	39	3.0%
El Cerrito	86	6.7%
Albany	39	3.0%
San Francisco	40	3.1%
Other	164	12.8%

[1] East Area and South Area III are defined in Table 1 and in Figure 5.

In taking the fee lot sample, I went through 699 permits of a total of approximately 5000 total fee lot permits. The results are presented in Table 2c.

Table 2c. Where Fee Lot Applicants Come From (699 Sample)

East Area[1]	79	11.3%
South Area III[1]	28	4.0%
Berkeley	259	37.0%
Oakland	115	16.4%
Richmond	26	3.7%
El Cerrito	20	2.9%
Albany	34	4.9%
San Francisco	69	9.9%
Other areas	70	10.0%

("Other"in this case means communities not tallied above. Alameda had 9 applicants, San Pablo 7, Kensington 5, and Pinole 5. All other communities included in "other" had fewer than 5 applicants.)

[1]East Area and South Area III are defined in Table 1 and in Figure 5.

Where Radiation Laboratory Parkers Live-- In addition to the approximately 16,000 regular University employees, there are approximately 2800 employees who work at the Lawrence Radiation Laboratory, which lies in the hills above the campus. Parking at the Radiation Laboratory is administered separately from that on the main campus. Radiation Laboratory parking permits are not good on the main campus, and campus permits are not good in the Radiation Laboratory.

For these 2800 employees, there are approximately 1800 parking spaces, plus a free bus system connecting the facility with the campus, and a taxi service providing transportation within the facility.

Mr. Warren G. Coolbaugh, transportation officer in the Radiation Laboratory's Business Services office, estimates that 40% of Radiation Laboratory employees live in what I call the East Zone. His figures are shown in Table 2d.

Table 2d. Location of Residence of Rad Lab Employees

Orinda, Lafayette, Walnut Creek, Concord, Martinez	40%
North Berkeley, Albany, El Cerrito, Richmond	20%
Oakland	10%
South Campus area	5%
Other scattered areas	5%

So it appears that about 1100 Radiation Laboratory employees come to that facility from East Zone areas every day. However, Mr. Coolbaugh estimates that a large portion of this number, perhaps a substantial majority, drive "over the top" by way of Strawberry Canyon and Wildcat Canyon Roads rather than use the Caldecott Tunnel route.

In addition to the 2800 regular employees, there are about 300 graduate students who work at the Rad Lab on a part-time basis. These students make use of the free half-hourly bus service in traveling between the Rad Lab and the campus.

BAY AREA TRANSPORTATION STUDY COMMISSION DATA AS APPLIED TO BERKELEY

What BATS Flow Figures Represent

BATS flow figures, both for automobiles and for transit, represent total flows for a 24-hour period. Thus, a worker leaving home in the morning, driving to work, and returning in the evening generates two trips. One is from home to work, and the other is from work to home.

Secondly, both of these trips are credited to having been produced in the home zone, even though the worker may work miles from home in another zone. All trips which either end or begin at home are considered to have been produced in the home zone. BATS calls these types of trips "home-based trips."

There are nine categories of trip types in BATS figures. These are:

1) Home-based work and related business
2) Home-based personal business, medical and dental
3) Home-based school
4) Home-based visit to friend or relative
5) Home-based trip for dining or recreation
6) Home-based convenience shopping
7) Home-based comparative shopping
8) Home-based other
9) Non-home-based
10) The total sum of the above 9 categories

Most trips are home-based. Non-home-based trips are assigned to the zone in which they are produced.

An example might help clarify the following figures. Suppose there were 20 people living in Berkeley and working in San Francisco, while at the same time there were 30 people living in San Francisco and working in Berkeley. Every day all of these people are making trips both to and from Berkeley. For each 24 hours, 50 trips enter Berkeley, and 50 trips leave Berkeley. However, by the BATS classification there would be 40 trips generated in Berkeley zone and going to the San Francisco zone, while there would be 60 trips generated in the San Francisco zone and going to the Berkeley zone, assuming everybody made a round trip the same day.

BATS Method for Obtaining Flow Figures

The heart of BATS is a model to project travel demand. The basis for this model came from a survey involving about 33,000 people distributed throughout the Bay Area, both in homes and on travel corridors. From this survey, BATS gathered and analyzed information on trip generation in families in relation to trip length, purpose, time of day, family size, family income, type of dwelling unit, and other socio-economic variables.

With the data that BATS obtained from this travel survey, it was able to build a model of trip generation based upon socio-economic characteristics of the population. Thus for any given socio-economic characteristics, BATS could determine the number of daily trips generated by each person. BATS could also determine the purpose of these trips.

The model built from this information when expanded to all people in each analysis zone throughout the Bay Area could determine how much and what type of travel would be generated on each day in each zone. As explained in Appendix B on the BATS Report Summary, BATS already had socio-economic information on Bay Area population broken down to the level of analysis zones (see Figure 1B for a map showing the 291 analysis zones). But it did not tell where this travel would go.

That question was answered by another model of a gravity model type. This model was based upon the assumption that trips from one zone to all other zones in the Bay Area are attracted in direct proportion to the attractiveness of all other zones, and in inverse proportion to the travel time between zones. Attractiveness is measured in terms of population size, employment opportunities, commercial activities, recreational opportunities and other factors.

This "trip distribution" model was put together with the previously discussed "trip generation" model to determine the flow of trips between all zones in the Bay Area for the base year 1965. The results were compared with actual counts taken in the field.

In almost all cases the flows projected by the models agreed within 10% of flows actually counted in the field, and it was felt that the model was satisfactory enough to make projections for 1980 and 1990, using the projected population, employment and socio-economic characteristics by zones already projected for those dates.

To determine how people would travel, whether by auto or by transit, and over which route required the testing of hypothetical highway and transit systems alongside each other, as well as assumptions about under which conditions people would use one over the other. These assumptions relied heavily upon comparisons of speed and the "trend" data discussed in Appendix B. People, for example, don't use transit for recreation trips on weekends, or for shopping, so almost all such trips would be assigned to the auto.

Note on Following Figures

The flows portrayed in Figures 4 through 18 are total traffic flows, the sum of all nine categories. In Figures 4a and 4b these flows are broken down as to whether they are made by transit or automobile. In the remainder of the figures, the flows represent the sum of automobile and transit trips.

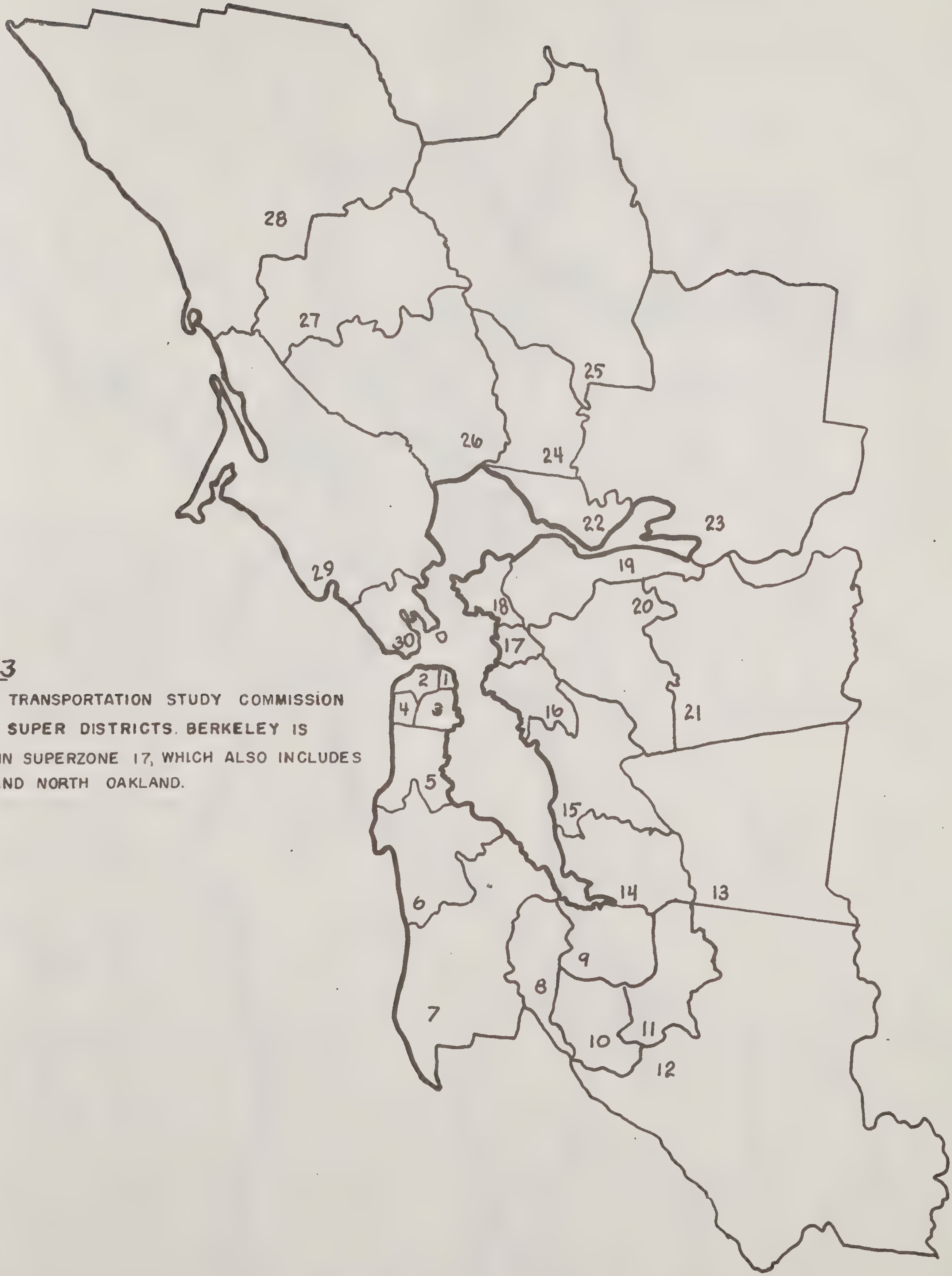


FIGURE 3

BAY AREA TRANSPORTATION STUDY COMMISSION (BATSC) SUPER DISTRICTS. BERKELEY IS INCLUDED IN SUPERZONE 17, WHICH ALSO INCLUDES ALBANY AND NORTH OAKLAND.

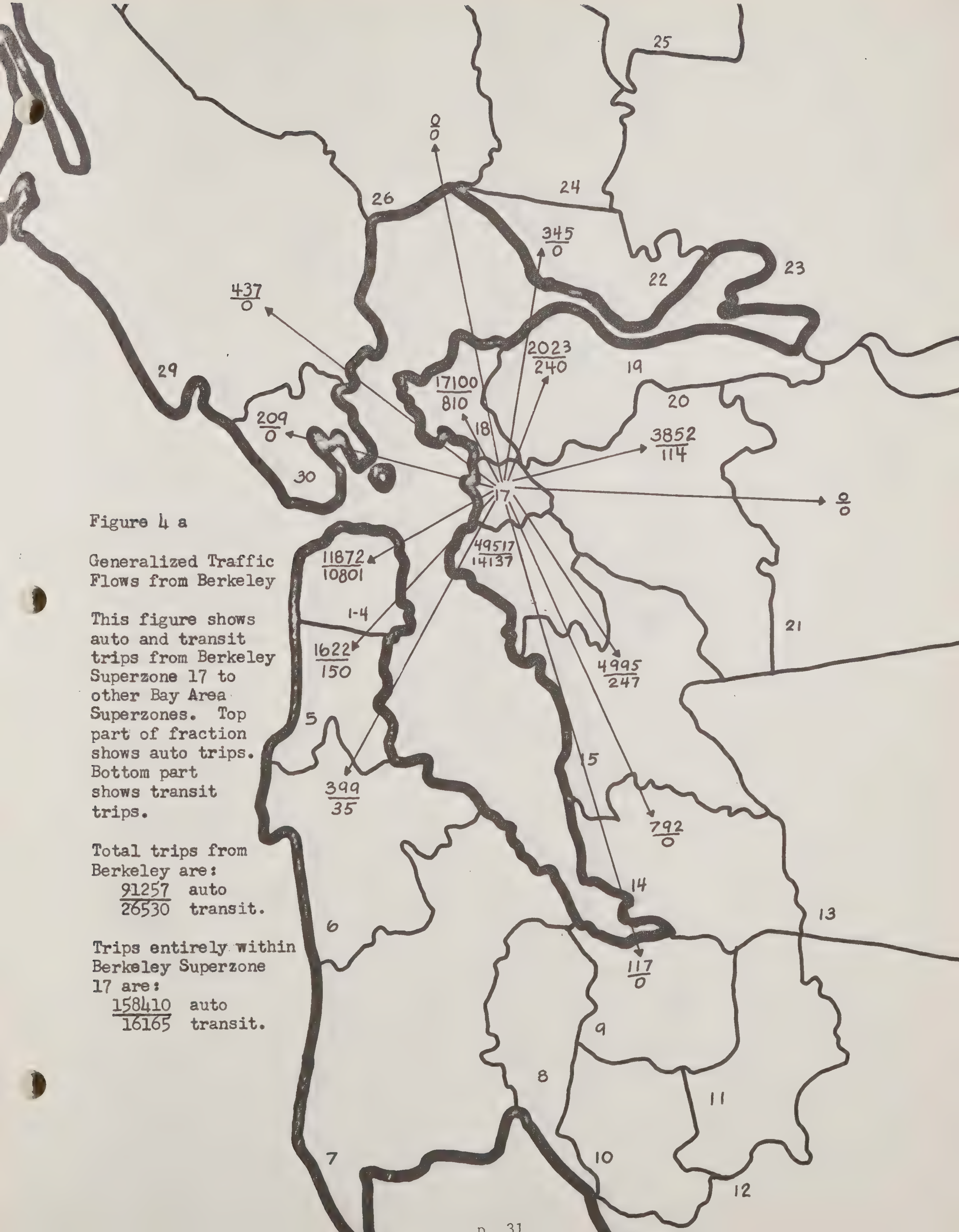


Figure 4 a

Generalized Traffic Flows from Berkeley

This figure shows auto and transit trips from Berkeley Superzone 17 to other Bay Area Superzones. Top part of fraction shows auto trips. Bottom part shows transit trips.

Total trips from Berkeley are:
91257 auto
26530 transit.

Trips entirely within Berkeley Superzone 17 are:
158410 auto
16165 transit.

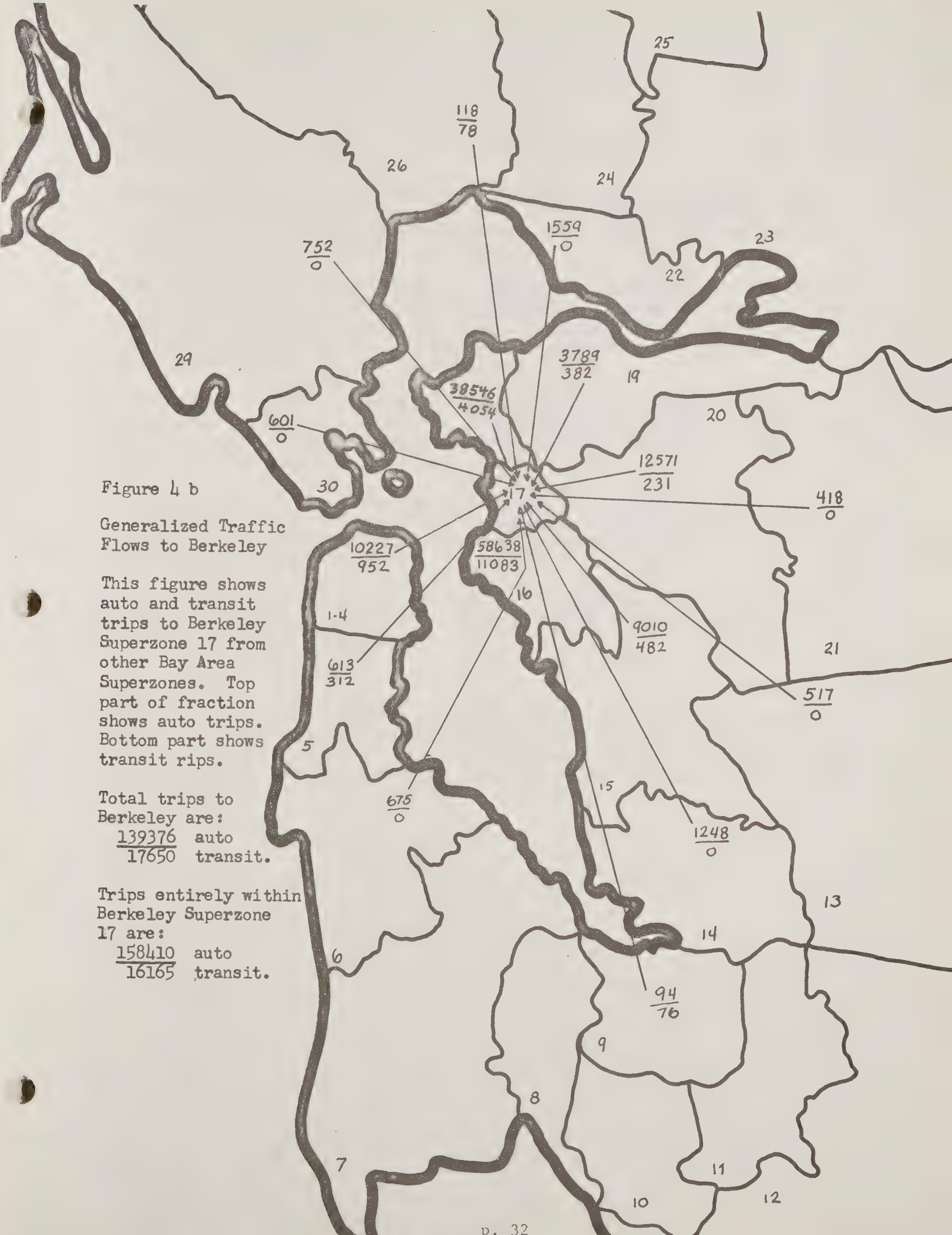


Figure 4 b

Generalized Traffic Flows to Berkeley

This figure shows auto and transit trips to Berkeley Superzone 17 from other Bay Area Superzones. Top part of fraction shows auto trips. Bottom part shows transit rips.

Total trips to Berkeley are:

$\frac{139376}{17650}$ auto / transit.

Trips entirely within Berkeley Superzone 17 are:

$\frac{158410}{16165}$ auto / transit.

A Finer-Grain Look at East Bay Flow Patterns as Applied to Berkeley

The following figures show the breakdown of flows going to and from eleven Berkeley city zones (BATS Analysis Zones), from 8 Bay Area regional zones, as well as local flows within Berkeley.

The 8 Bay Area regional zones are arbitrary agglomerations of Bay Area BATS Analysis Zones. The really fine breakdown of flows from each East Bay Analysis zone to each Berkeley Analysis can be found in Tables 3 through 18, as well as which of these zones are agglomerated into which regional zones. The figures do not give this information.

Figure 5 shows the location of 8 Bay Area Regional Zones (South Zone I, South Zone II, South Zone III, East Zone and North Zone) in relation to the Berkeley Central Zone. Figure 6 shows the breakdown of Berkeley Central Zone into eleven city or analysis zones.

Figures 7a and 7b show flows coming from the 8 regional zones to each of the Berkeley city zones, as well as flows going to each of the five regional zones from each of the Berkeley city zones. Figures 8 through 18 show local flows within Berkeley.

These flows lump automobile and transit trips together. At this time, BATSC computer print-outs do not contain differentiations between auto and transit trips at this level of analysis.

Note: On Figures 8 through 18 concerning local flows, numbers in center of zones to or from which all arrows point represent the totals of all flows either to or from that zone. The number in parentheses represents the number of trips within each zone; that is, trips which both originate and terminate within the same zone.

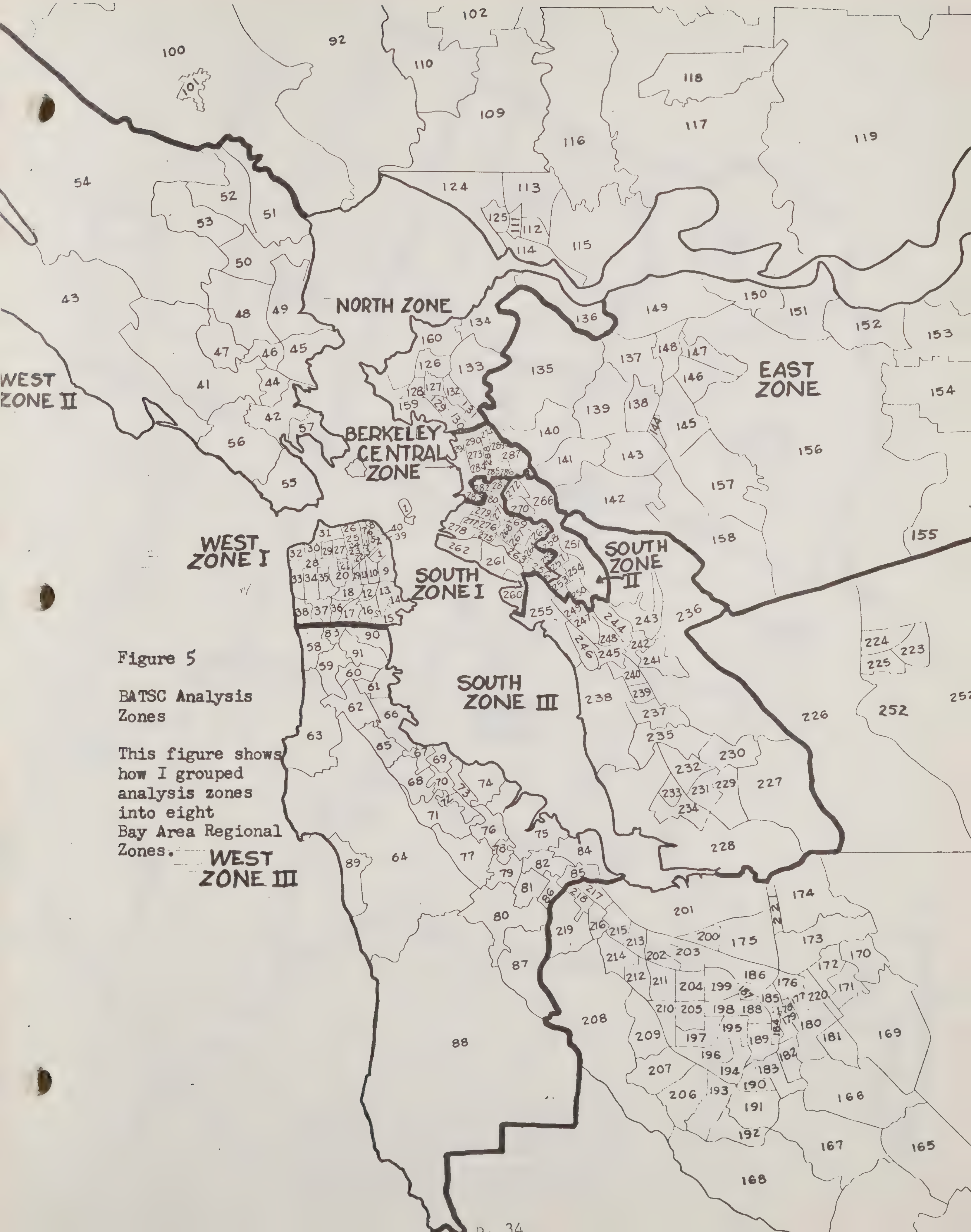


Figure 5

BATSC Analysis Zones

This figure shows how I grouped analysis zones into eight Bay Area Regional Zones.

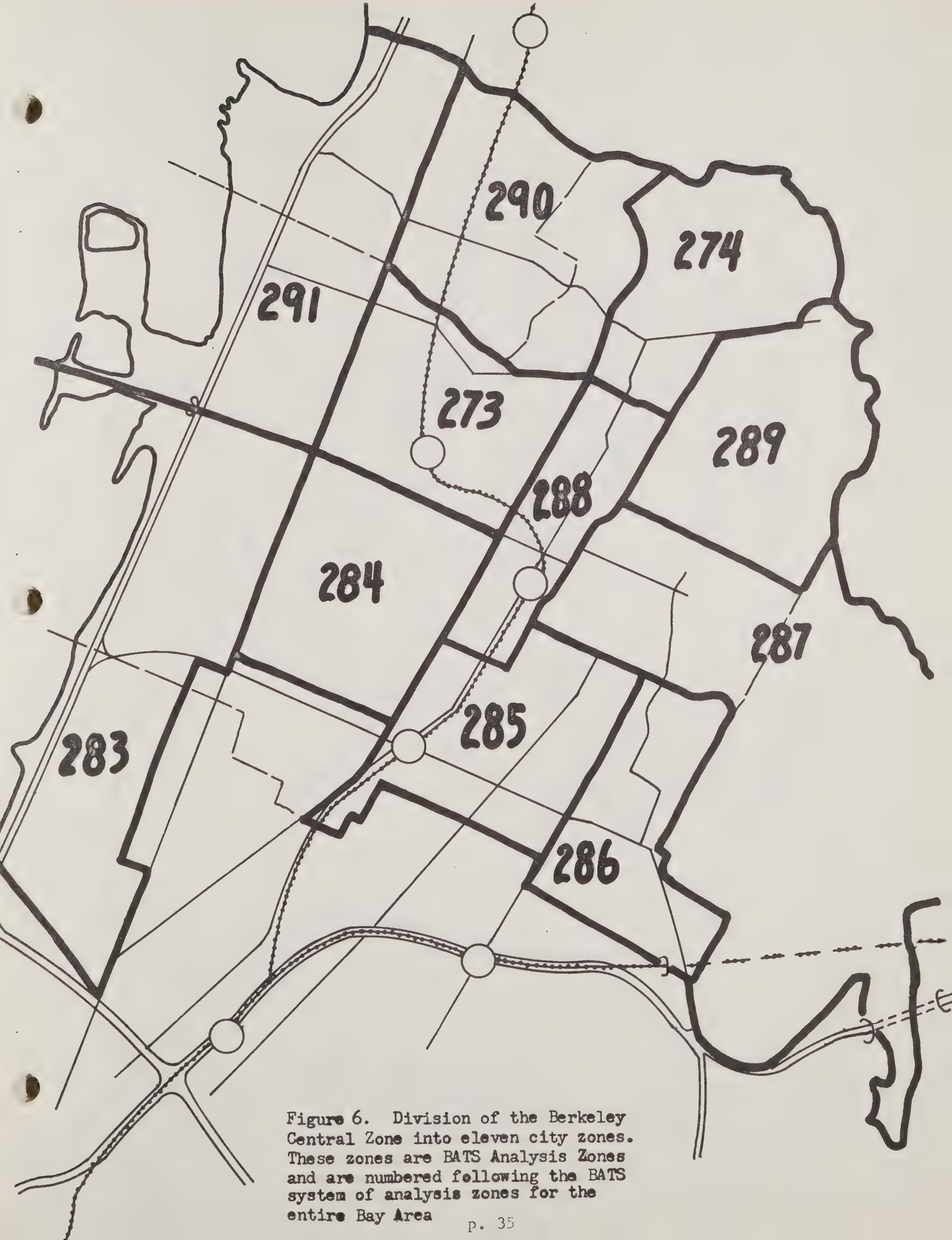


Figure 6. Division of the Berkeley Central Zone into eleven city zones. These zones are BATS Analysis Zones and are numbered following the BATS system of analysis zones for the entire Bay Area

FIGURE 7a REGIONAL FLOWS

TOTAL FLOWS TO BERKELEY FROM ZONES NORTH, EAST AND SOUTH

FIGURE 7b - REGIONAL FLOWS

TOTAL FLOWS FROM BERKELEY ZONE
TO ZONES NORTH, EAST AND SOUTH

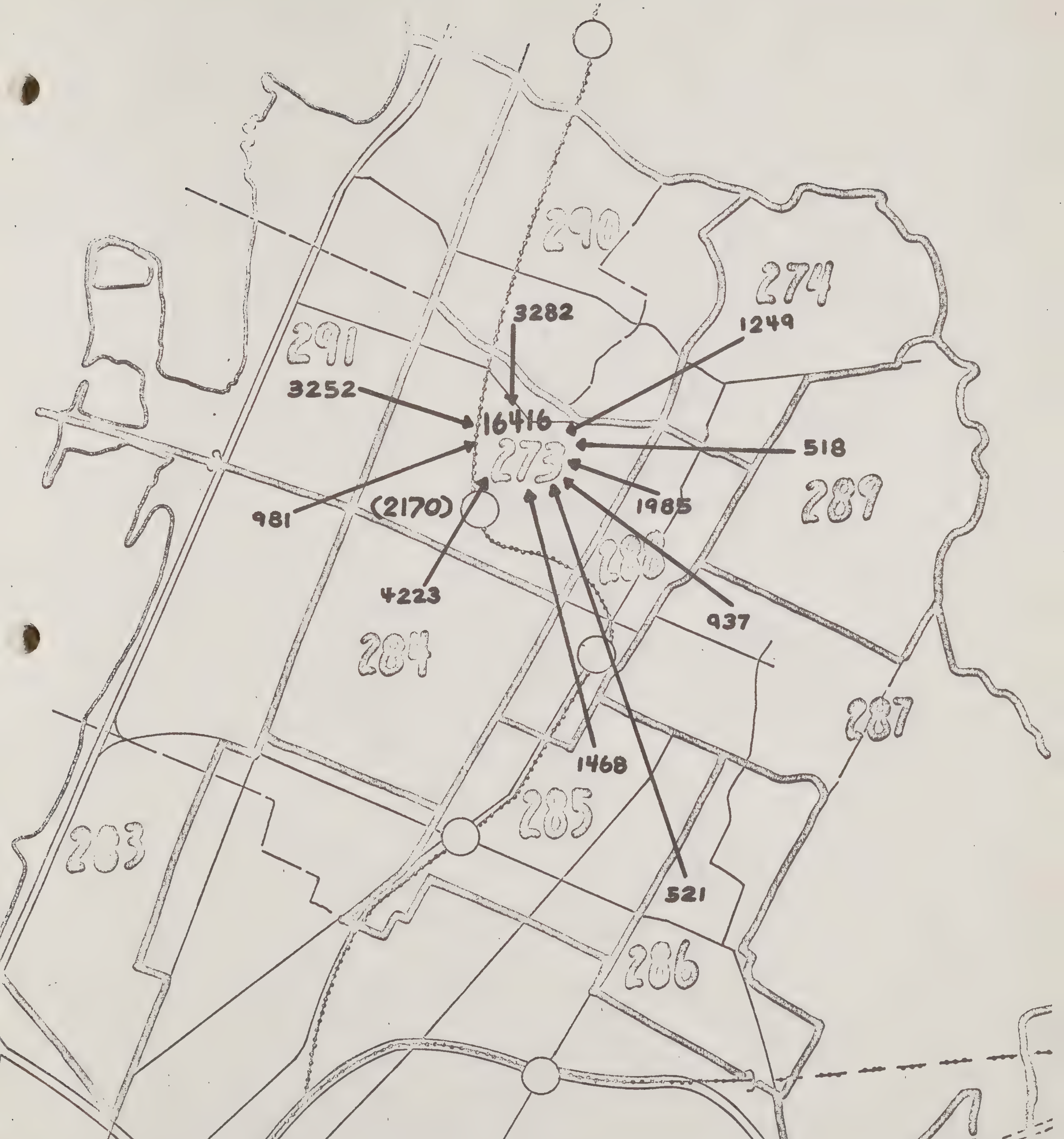


FIGURE 8a.
LOCAL FLOWS

TOTAL FLOWS FROM ALL BERKELEY TO ZONE 273.
FLOW WITHIN 273.

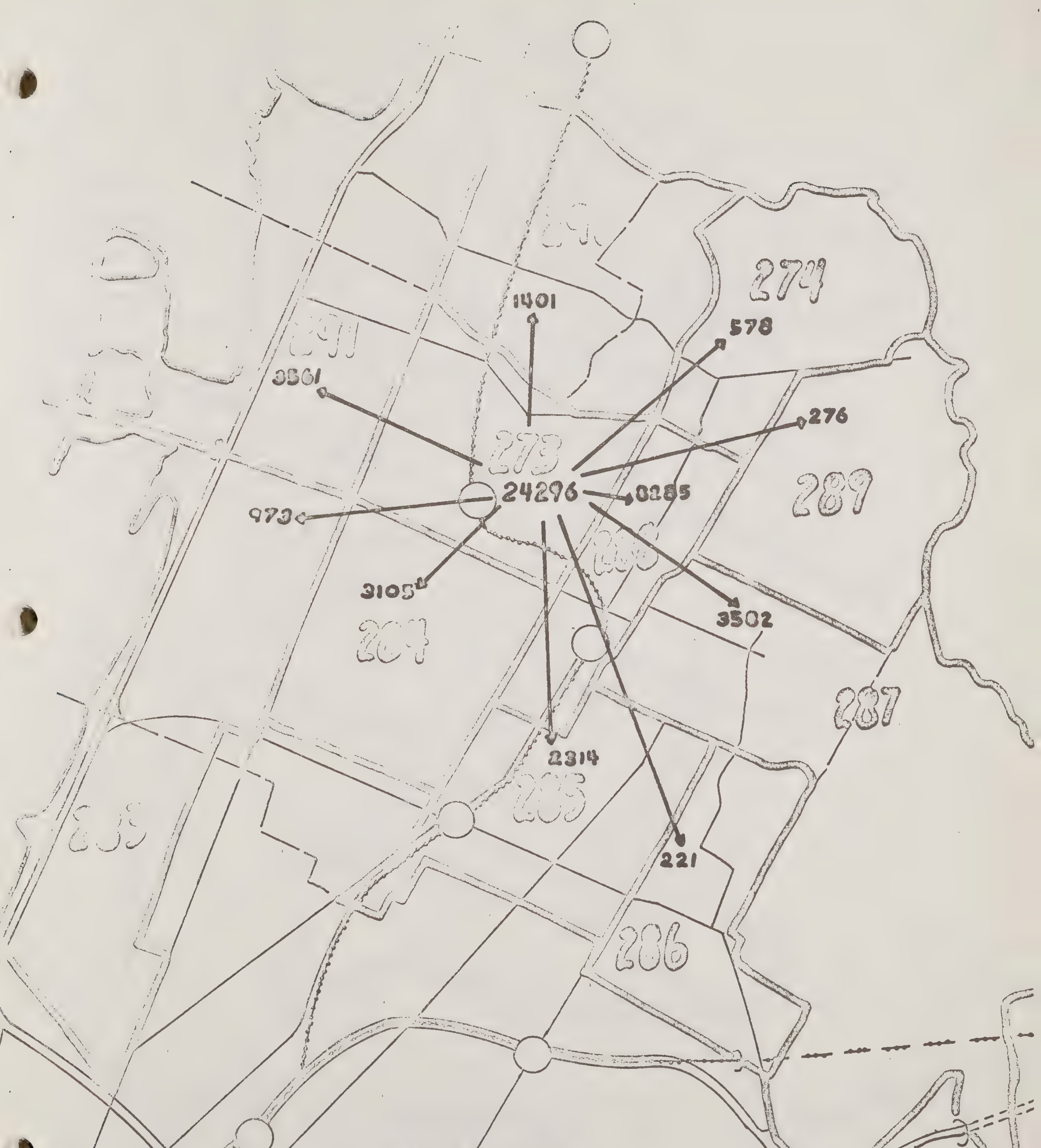


FIGURE 8b.
LOCAL FLOWS
TOTAL FLOWS FROM ZONE
273 TO ALL BERKELEY ZONES.
FLOW WITHIN 273.

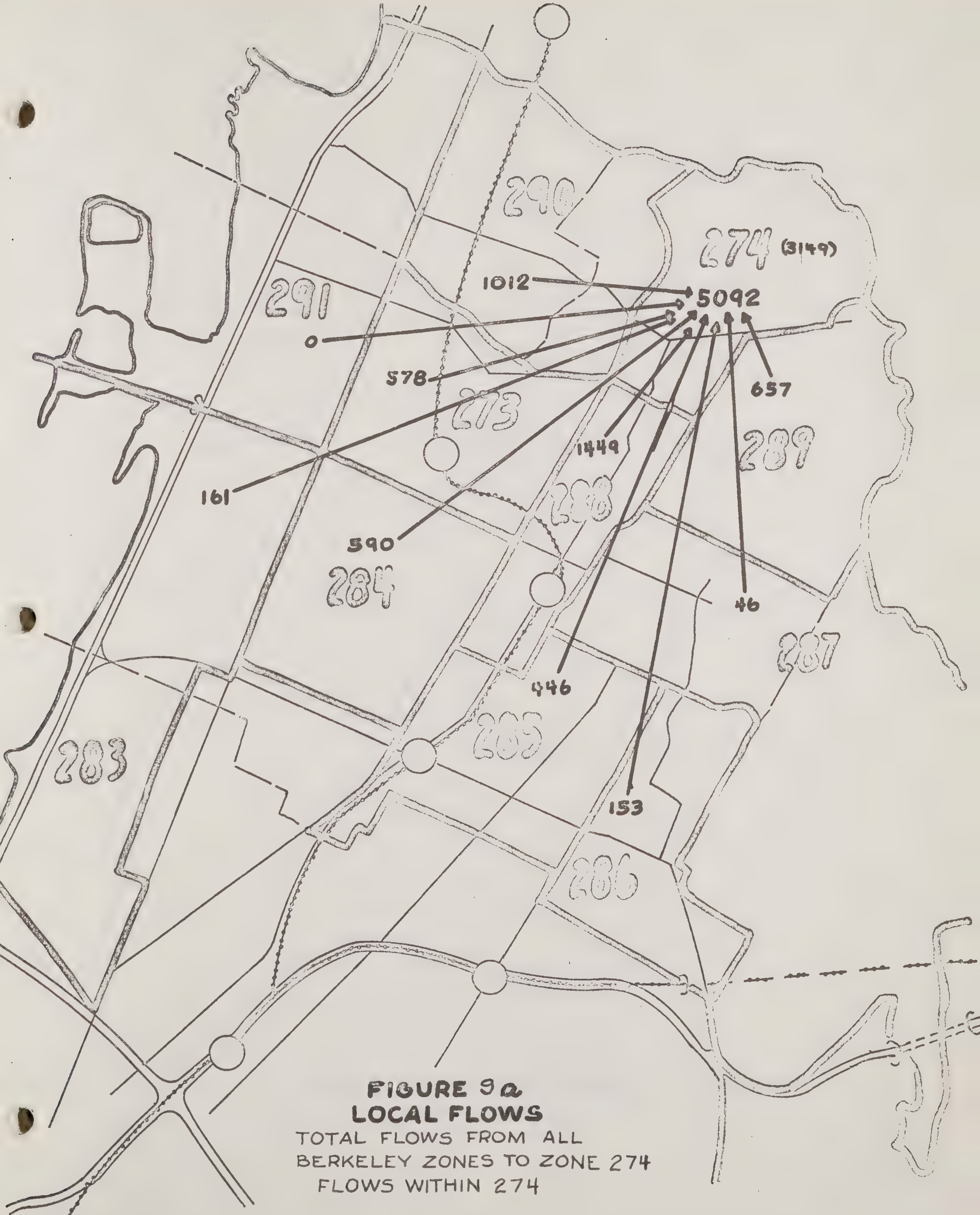


FIGURE 9a
LOCAL FLOWS
TOTAL FLOWS FROM ALL
BERKELEY ZONES TO ZONE 274
FLOWS WITHIN 274

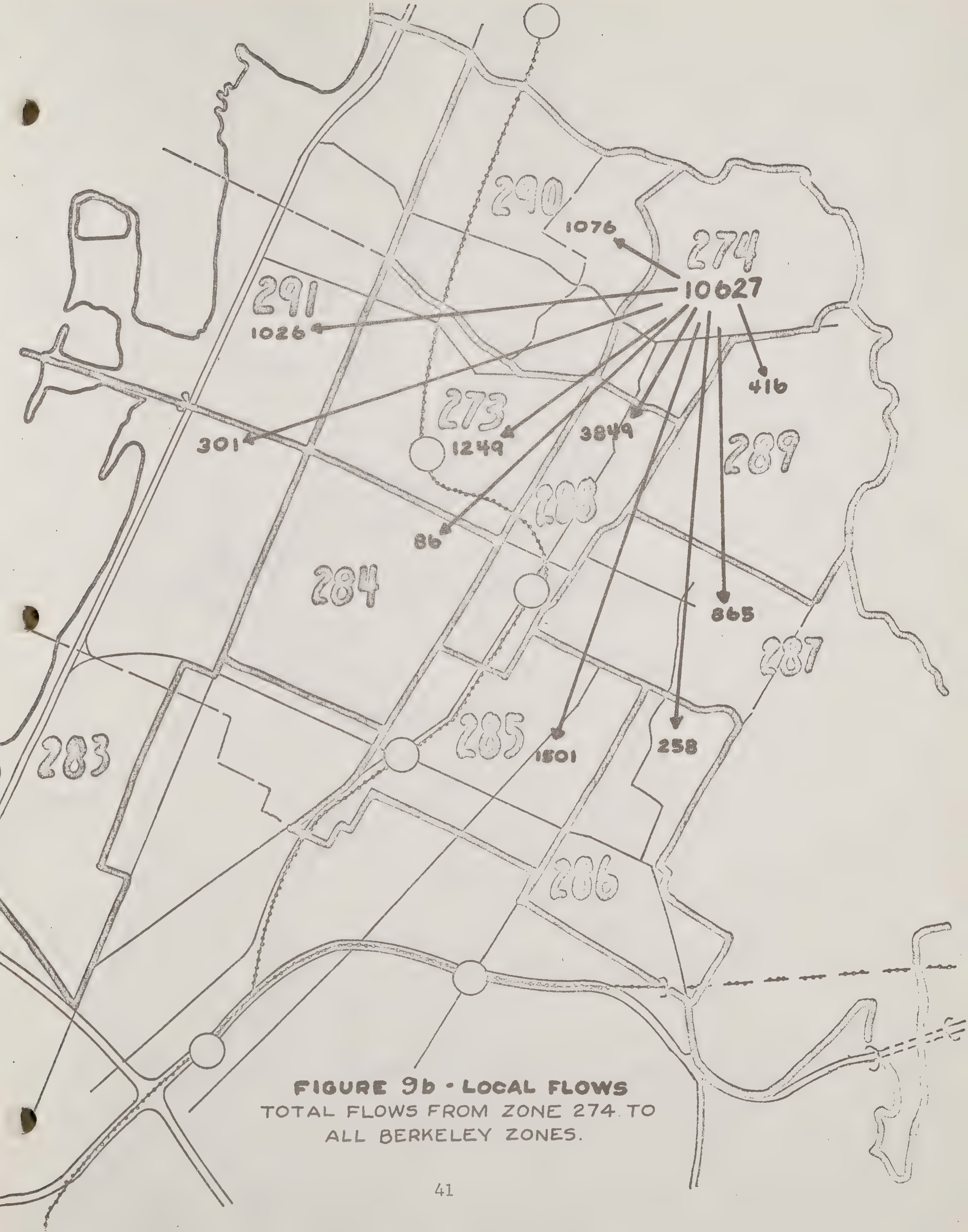


FIGURE 9b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 274 TO
ALL BERKELEY ZONES.

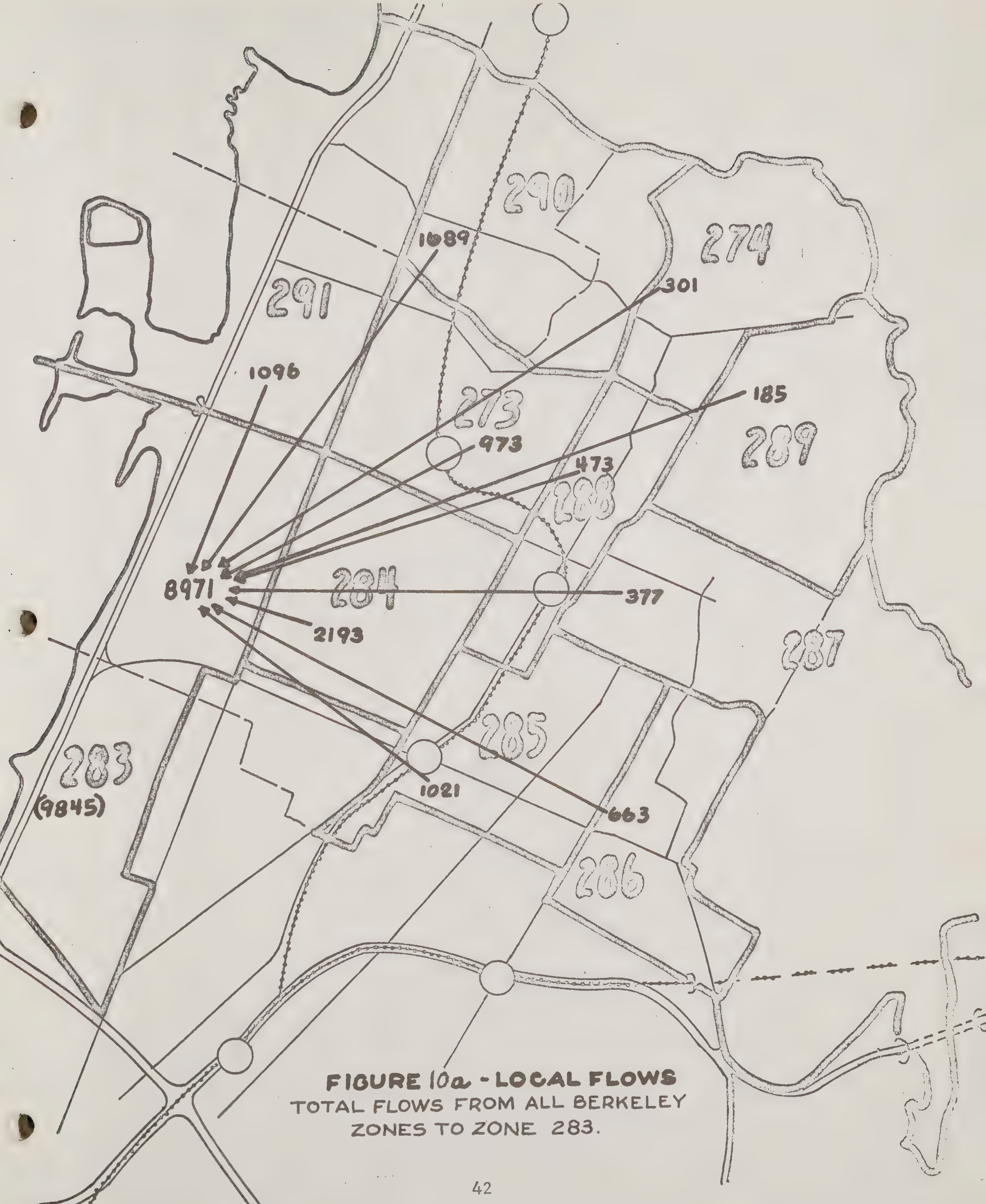


FIGURE 10a - LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY ZONES TO ZONE 283.

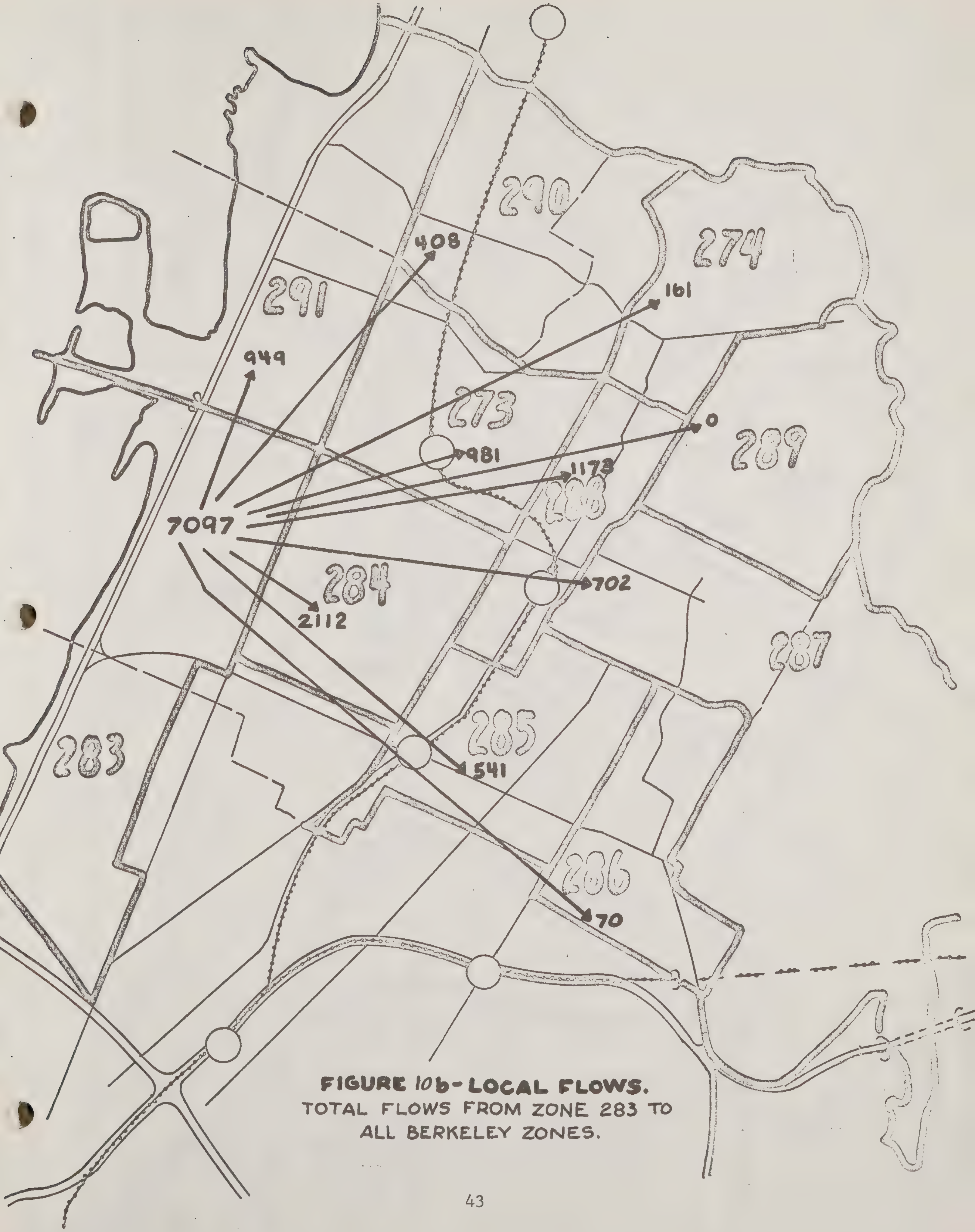


FIGURE 10b - LOCAL FLOWS.
TOTAL FLOWS FROM ZONE 283 TO
ALL BERKELEY ZONES.

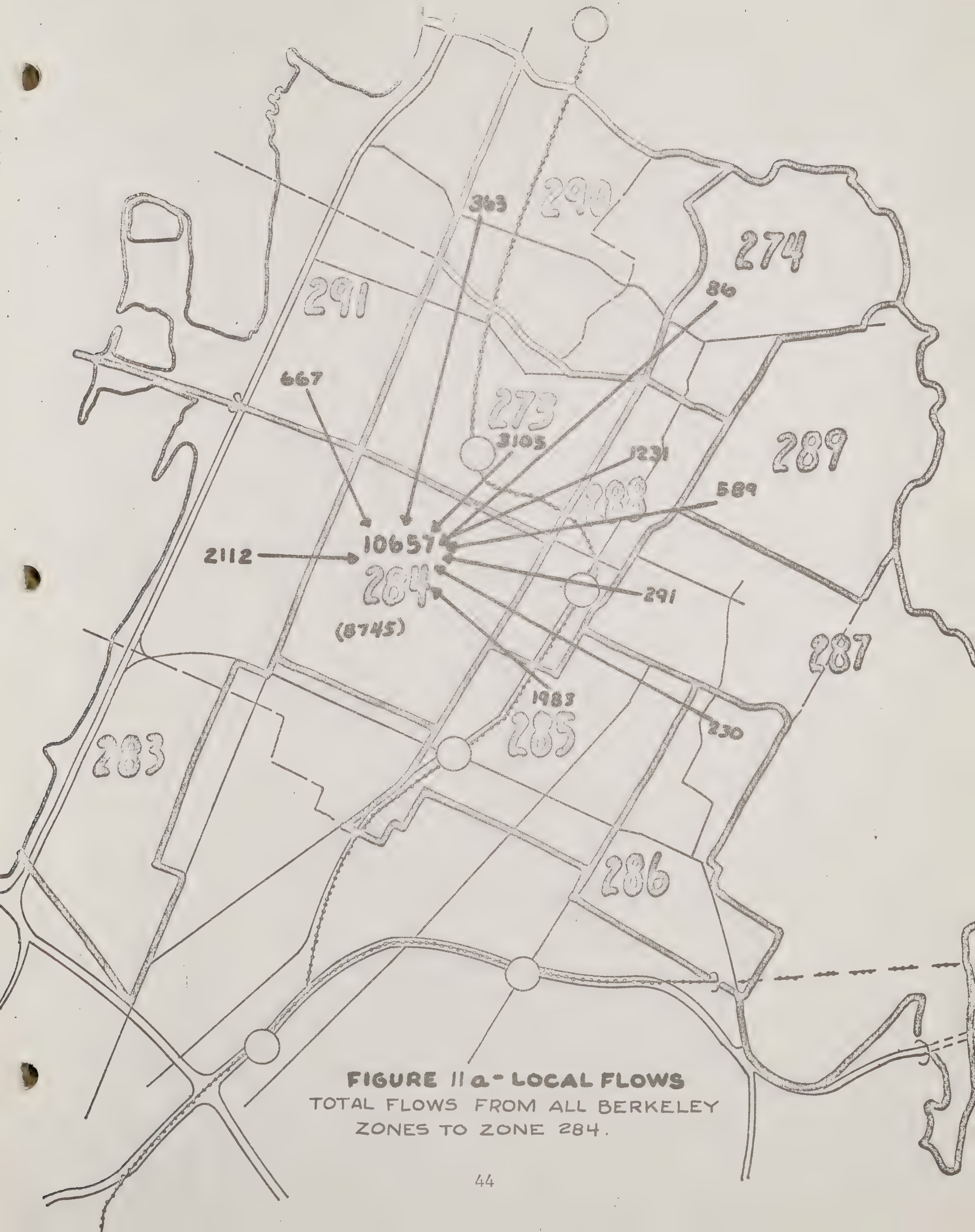


FIGURE 11a - LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY
ZONES TO ZONE 284.

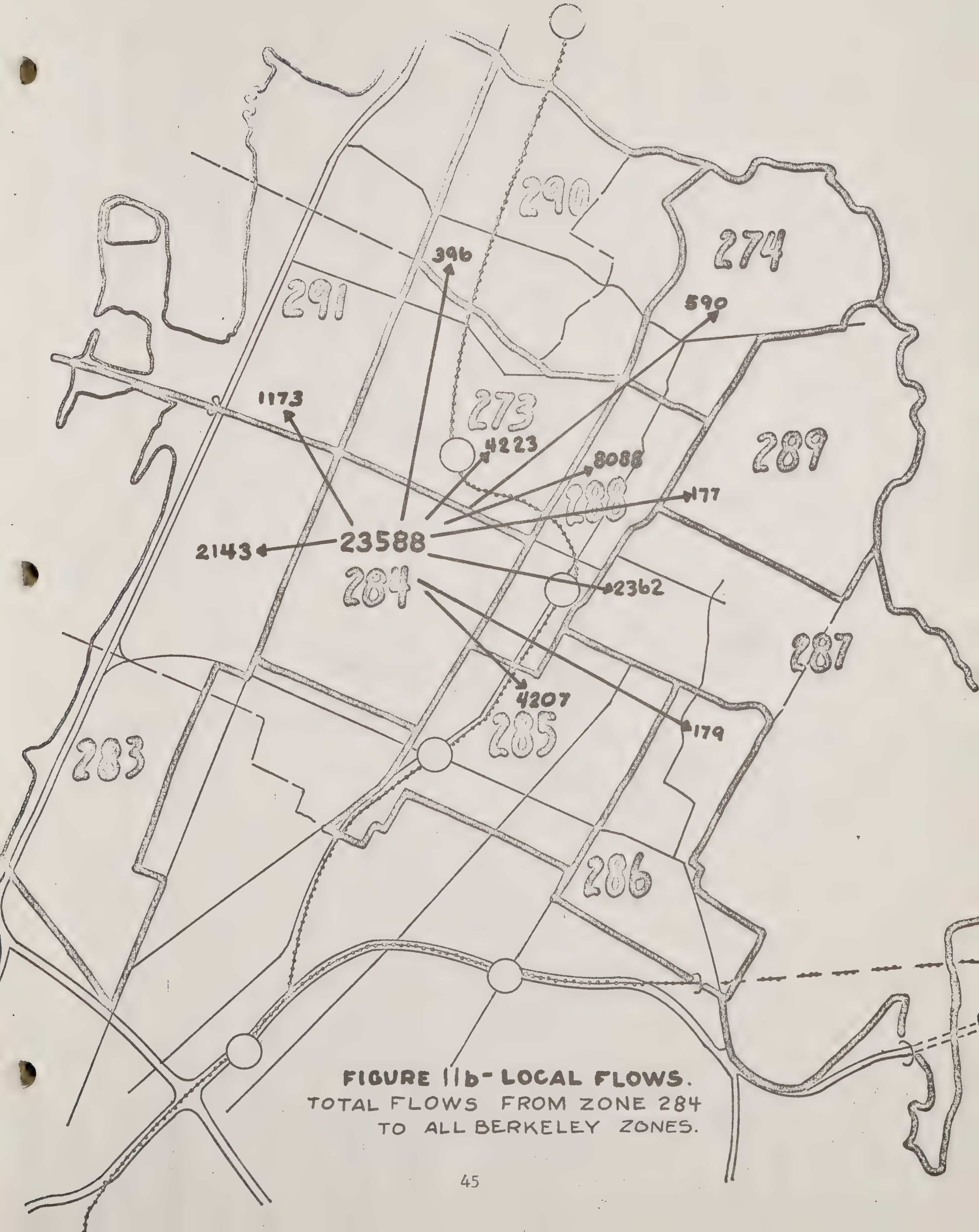


FIGURE 11b- LOCAL FLOWS.
TOTAL FLOWS FROM ZONE 284
TO ALL BERKELEY ZONES.

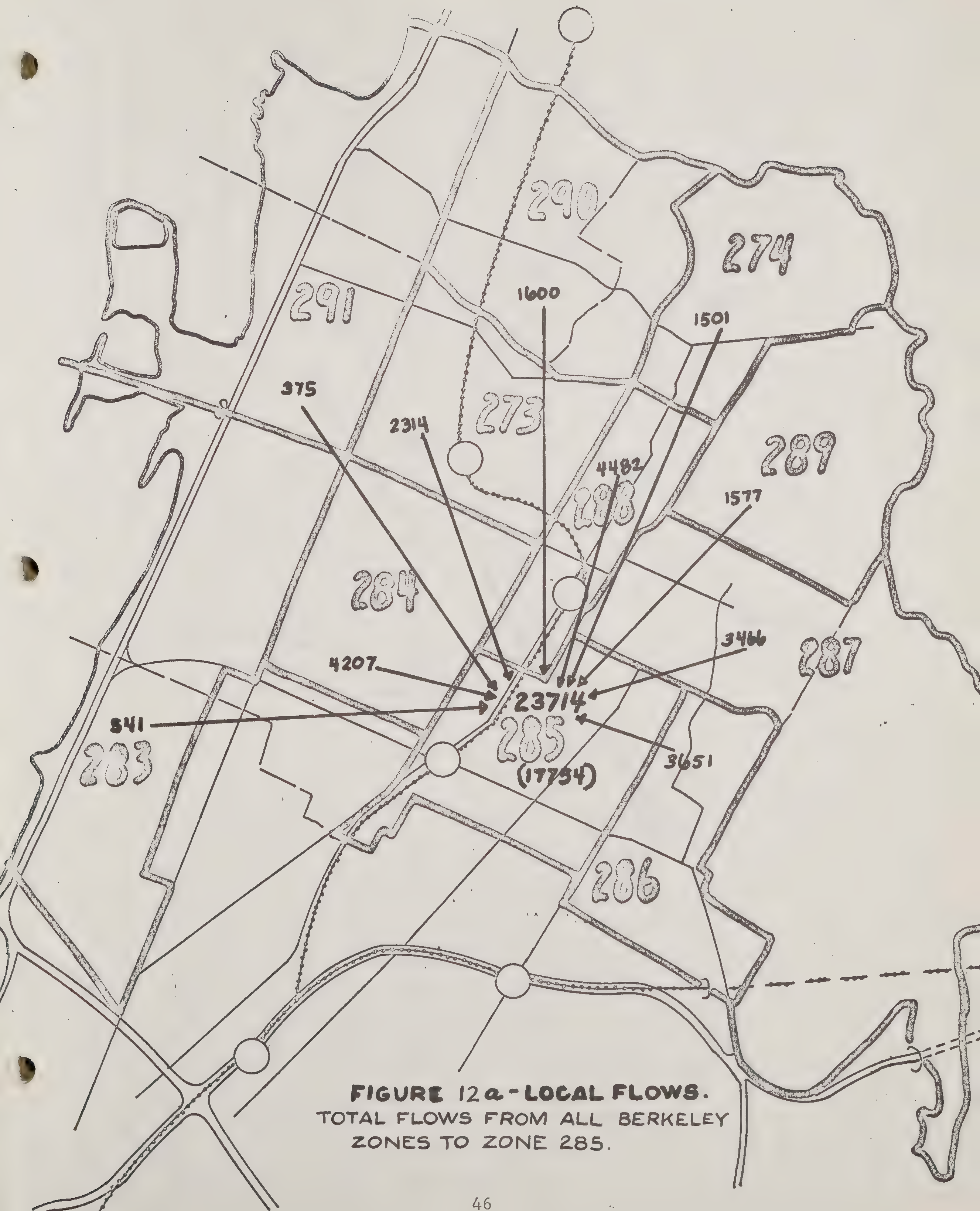


FIGURE 12a - LOCAL FLOWS.
TOTAL FLOWS FROM ALL BERKELEY ZONES TO ZONE 285.

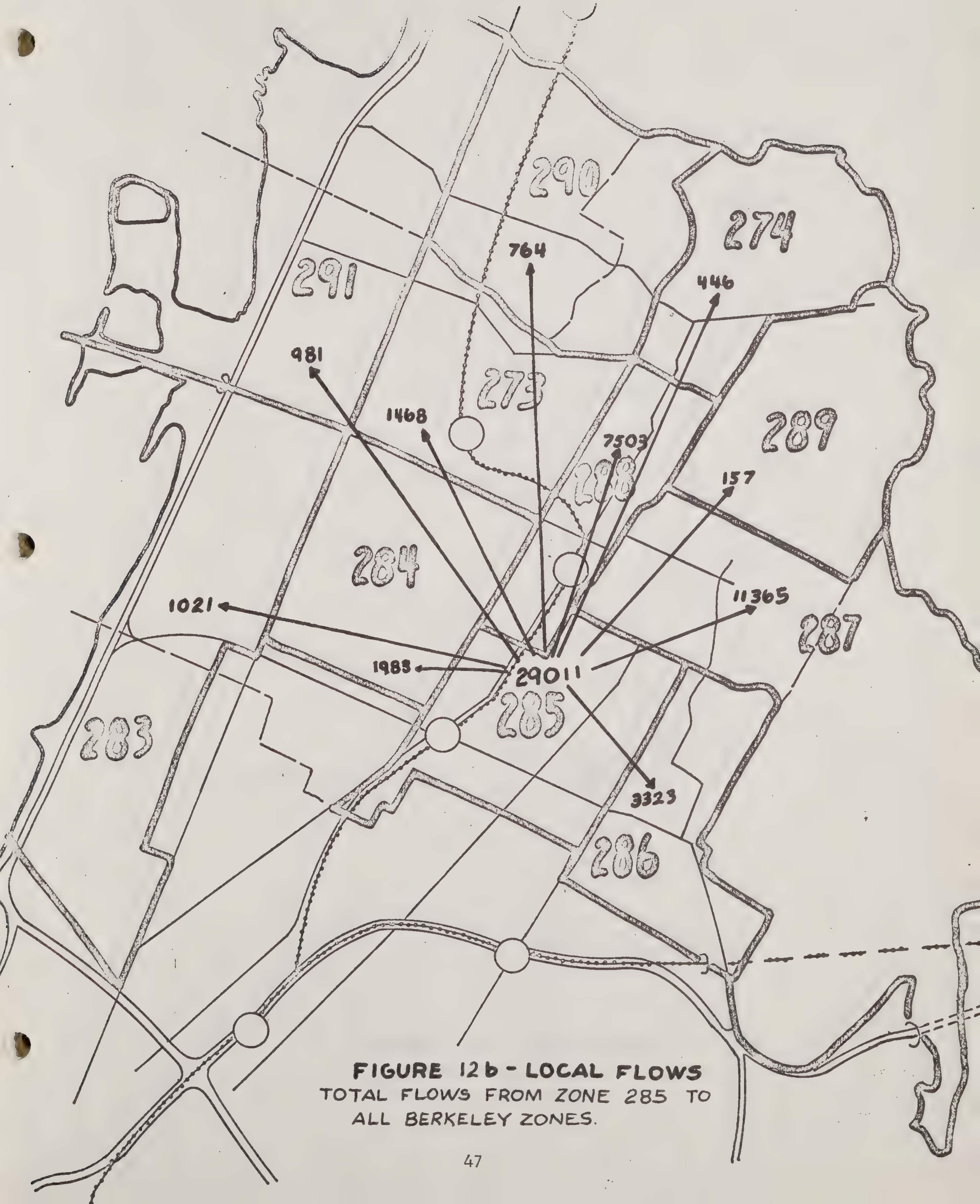


FIGURE 12b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 285 TO ALL BERKELEY ZONES.

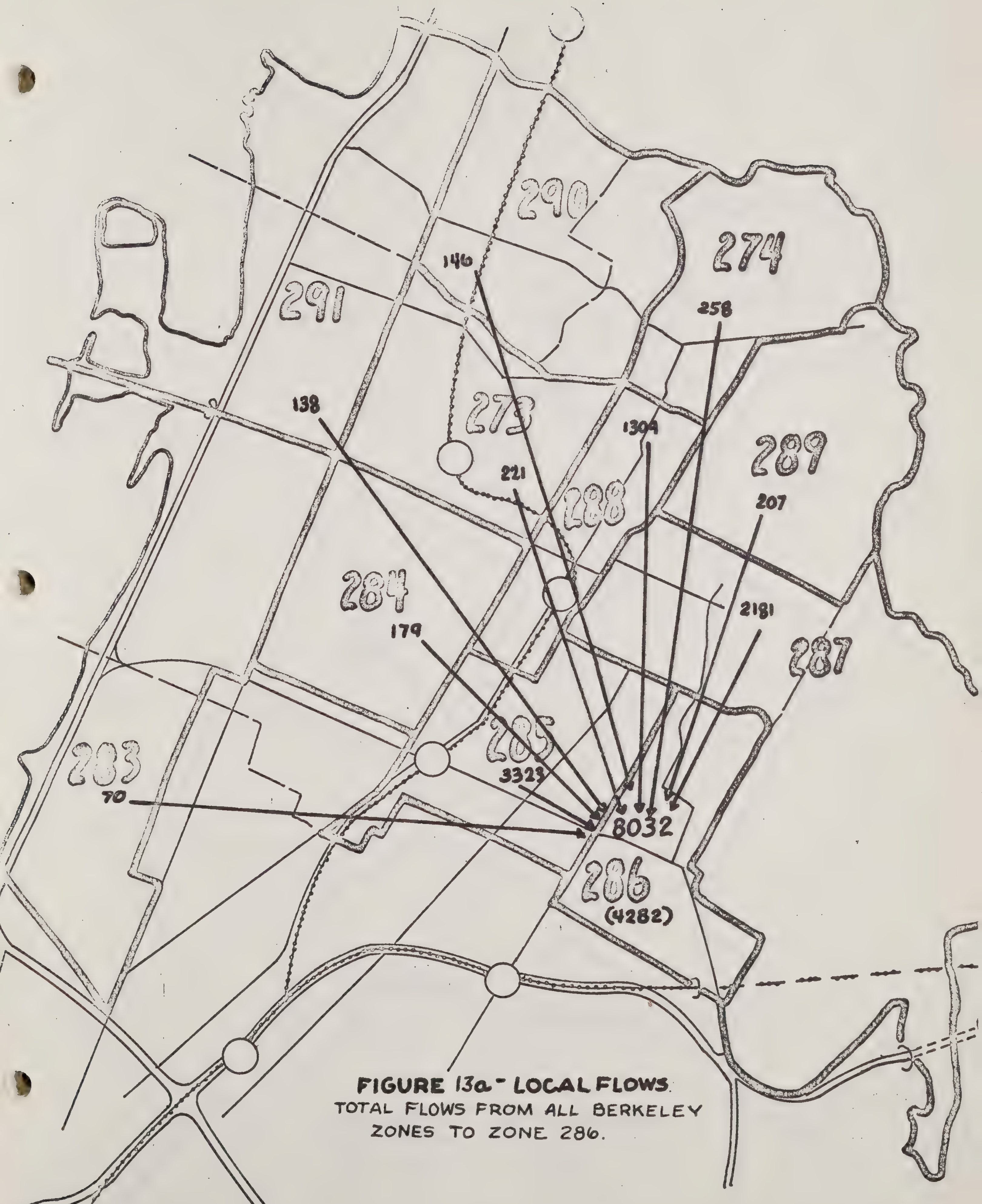


FIGURE 13a - LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY
ZONES TO ZONE 286.

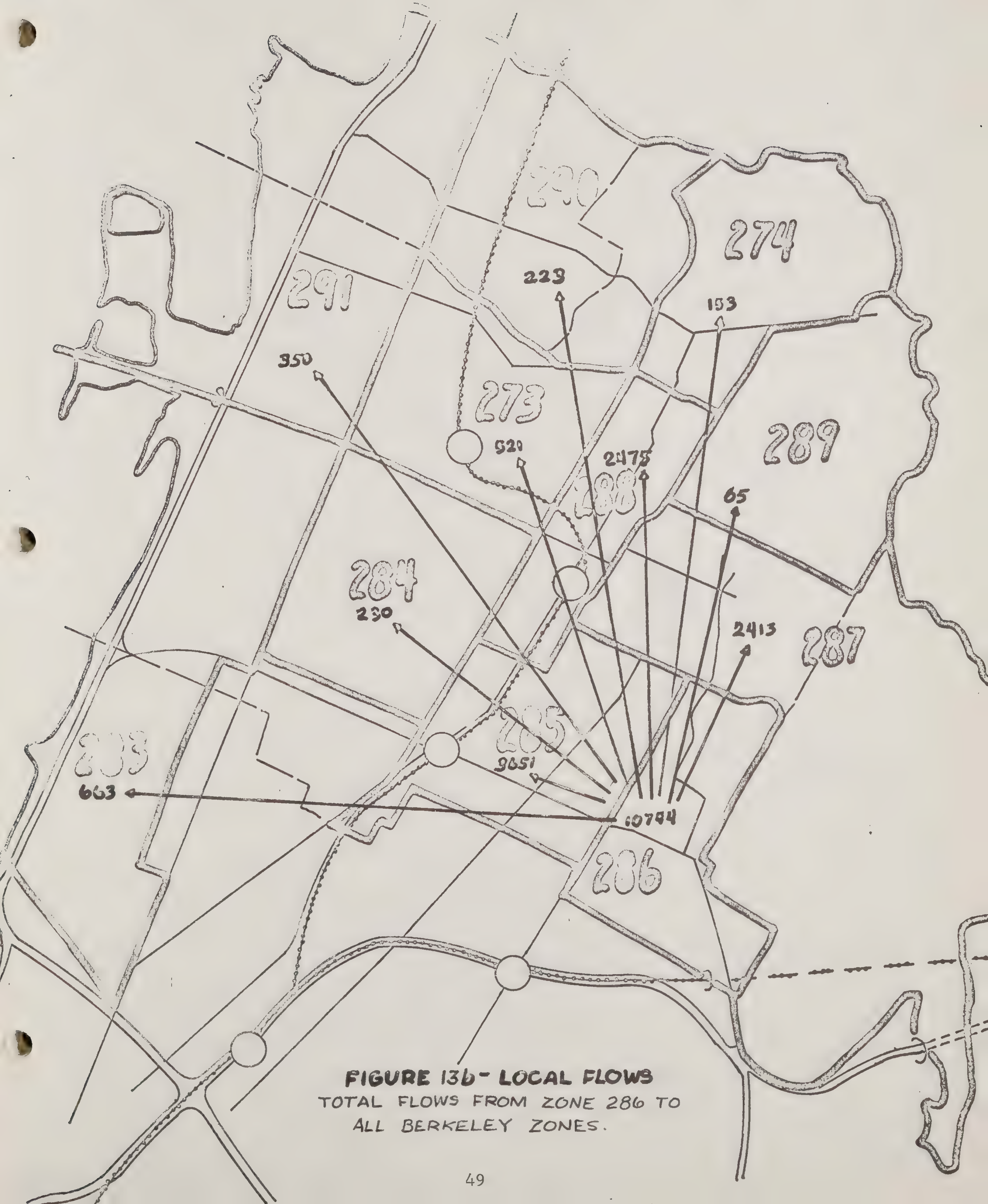


FIGURE 13b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 286 TO
ALL BERKELEY ZONES.

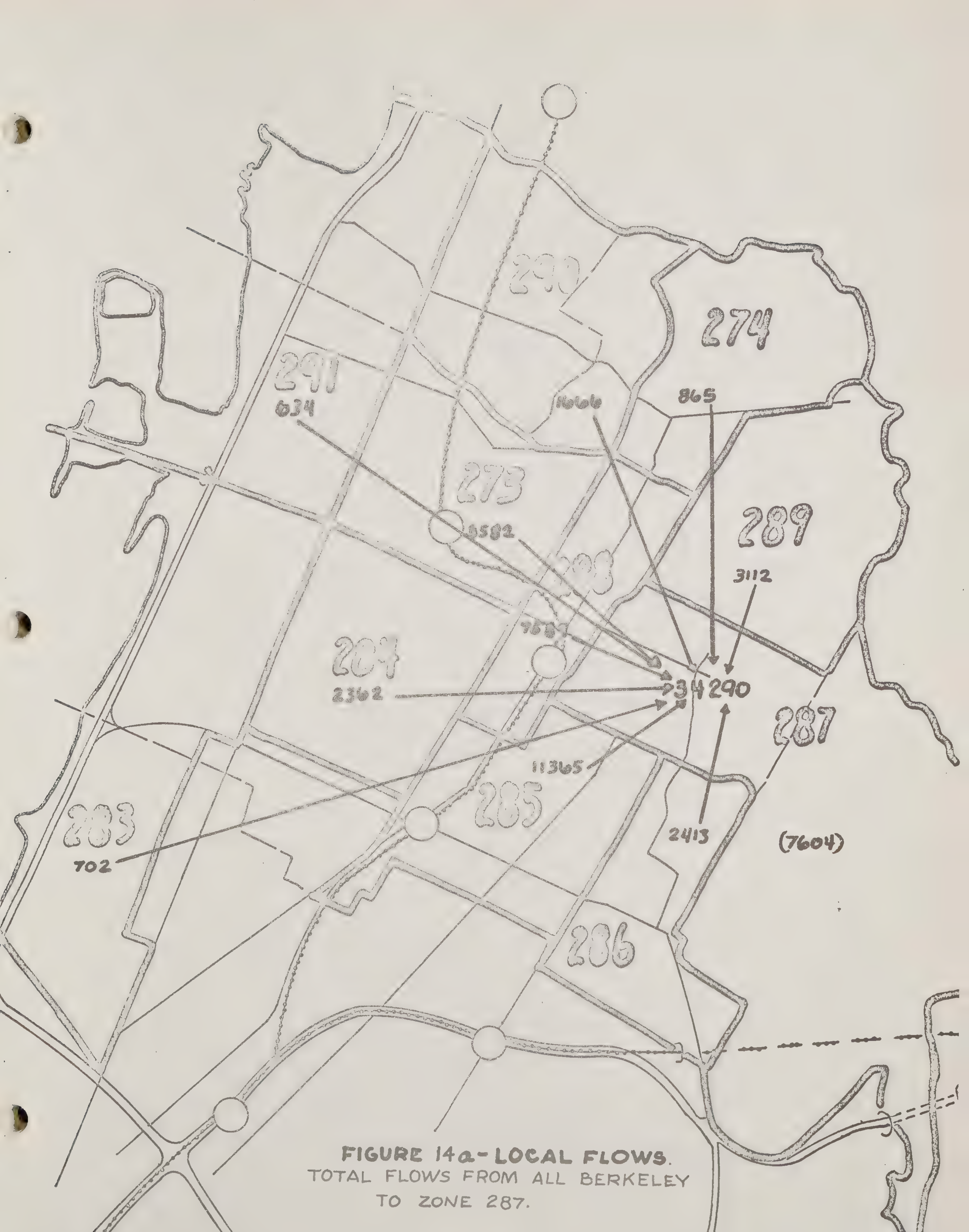


FIGURE 14a - LOCAL FLOWS.
TOTAL FLOWS FROM ALL BERKELEY
TO ZONE 287.

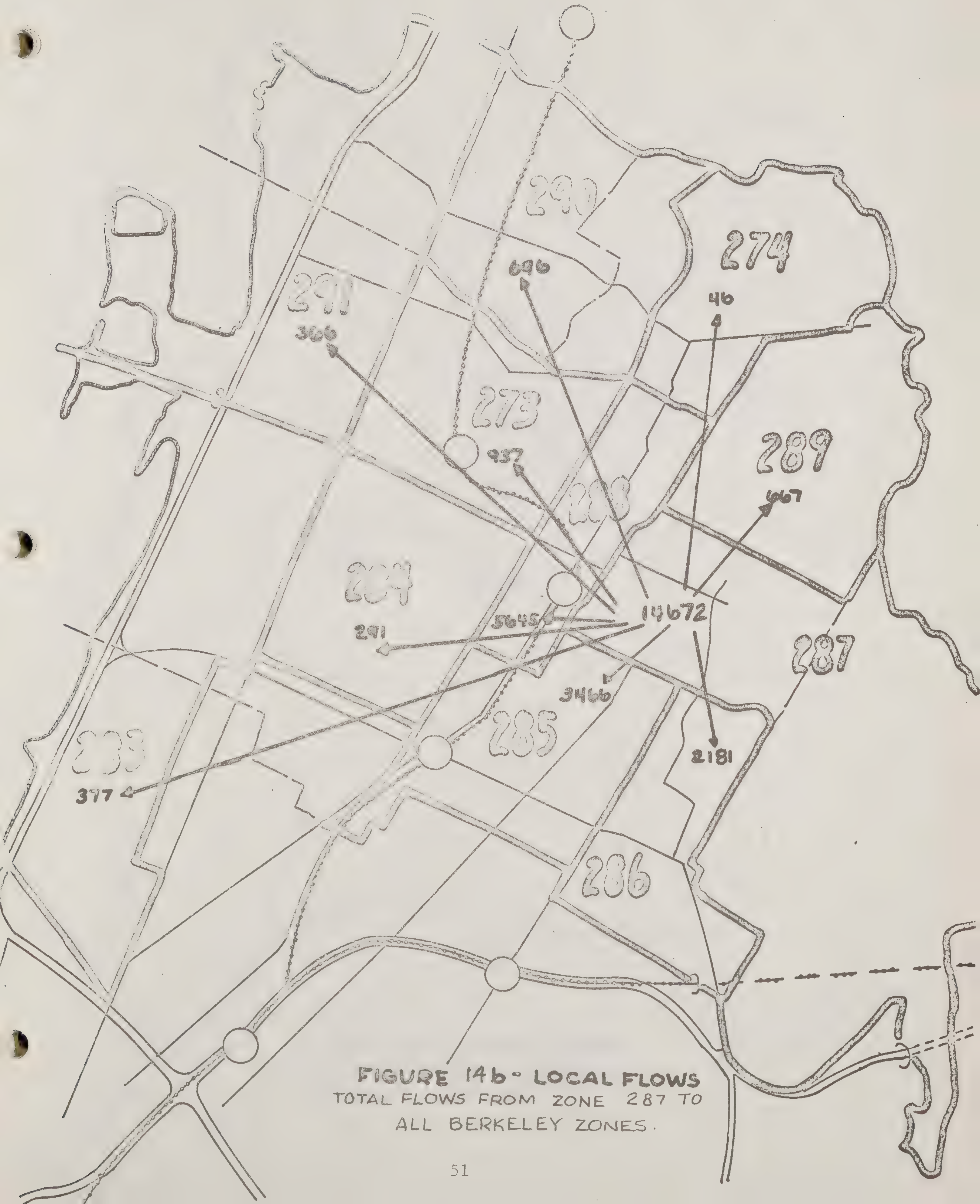


FIGURE 14b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 287 TO
ALL BERKELEY ZONES.

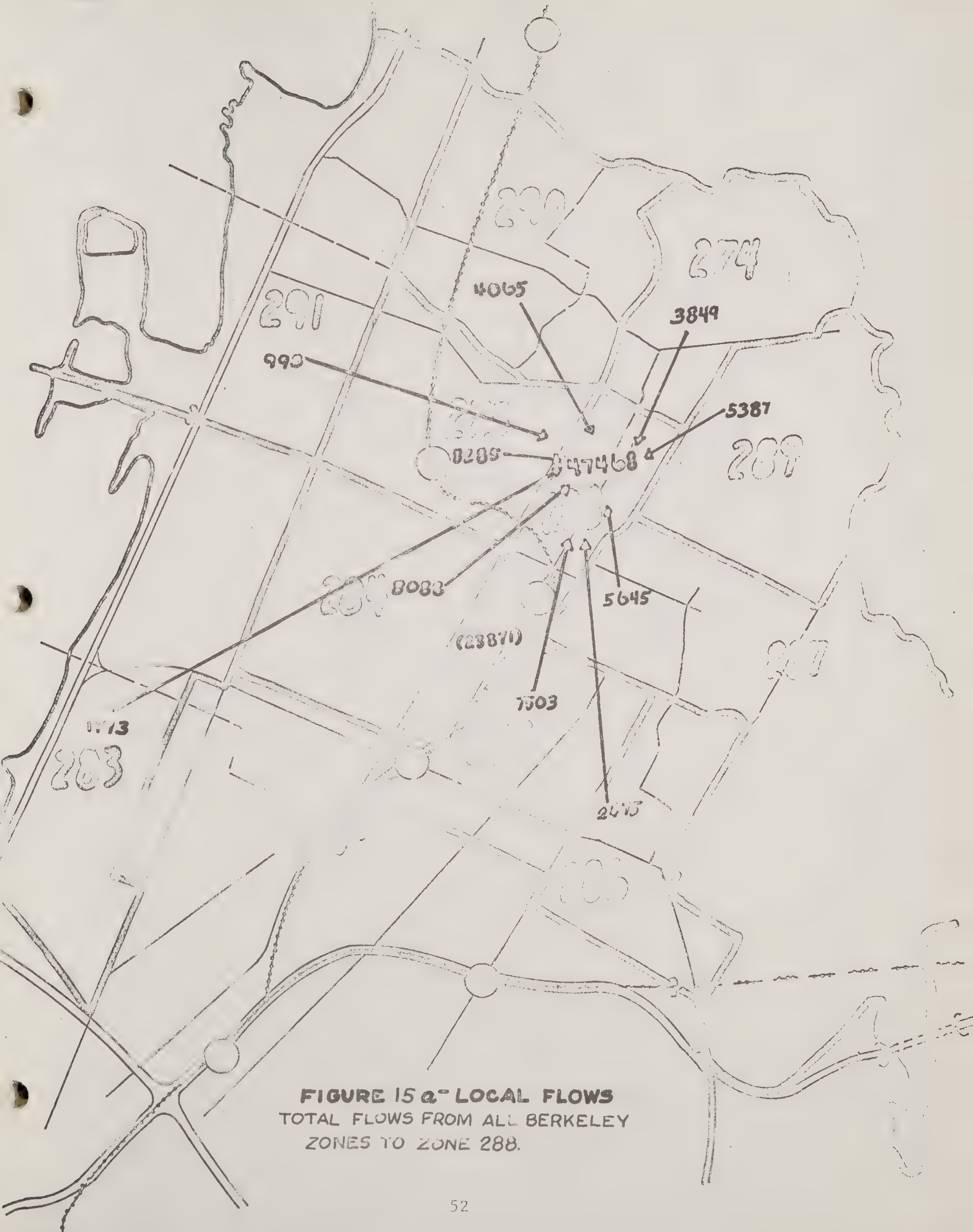


FIGURE 15 a – LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY
ZONES TO ZONE 288.

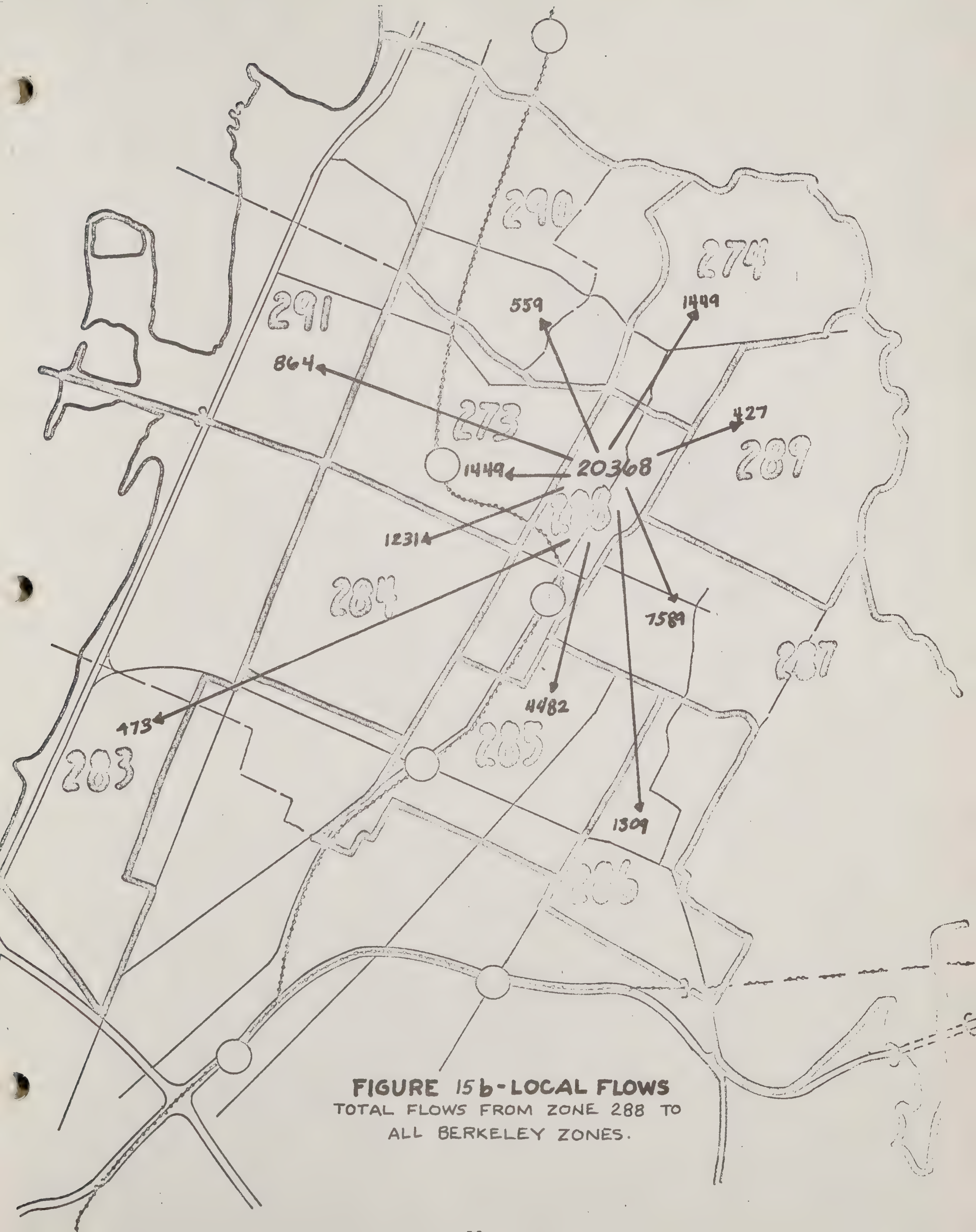


FIGURE 15 b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 288 TO
ALL BERKELEY ZONES.

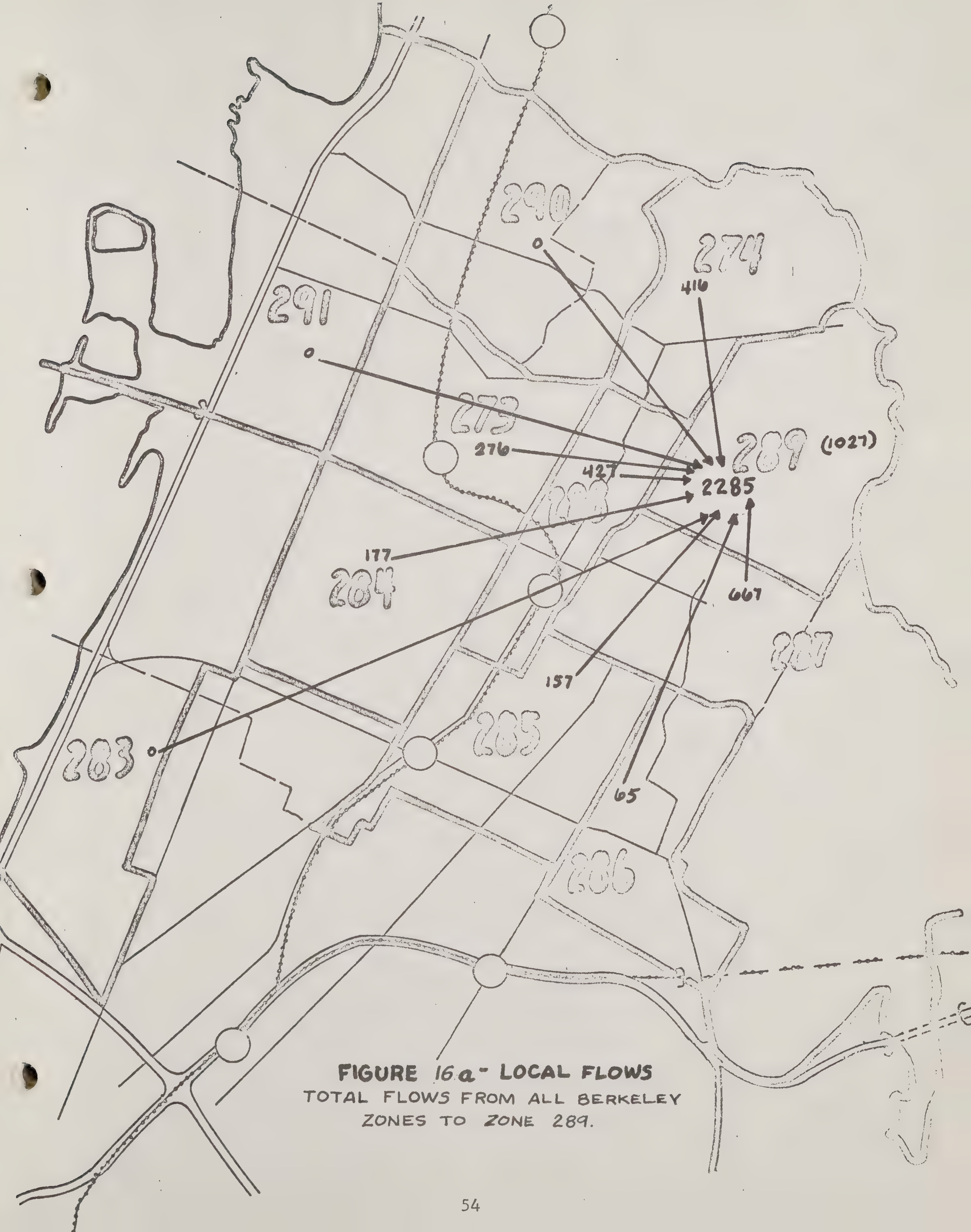


FIGURE 16a - LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY ZONES TO ZONE 289.

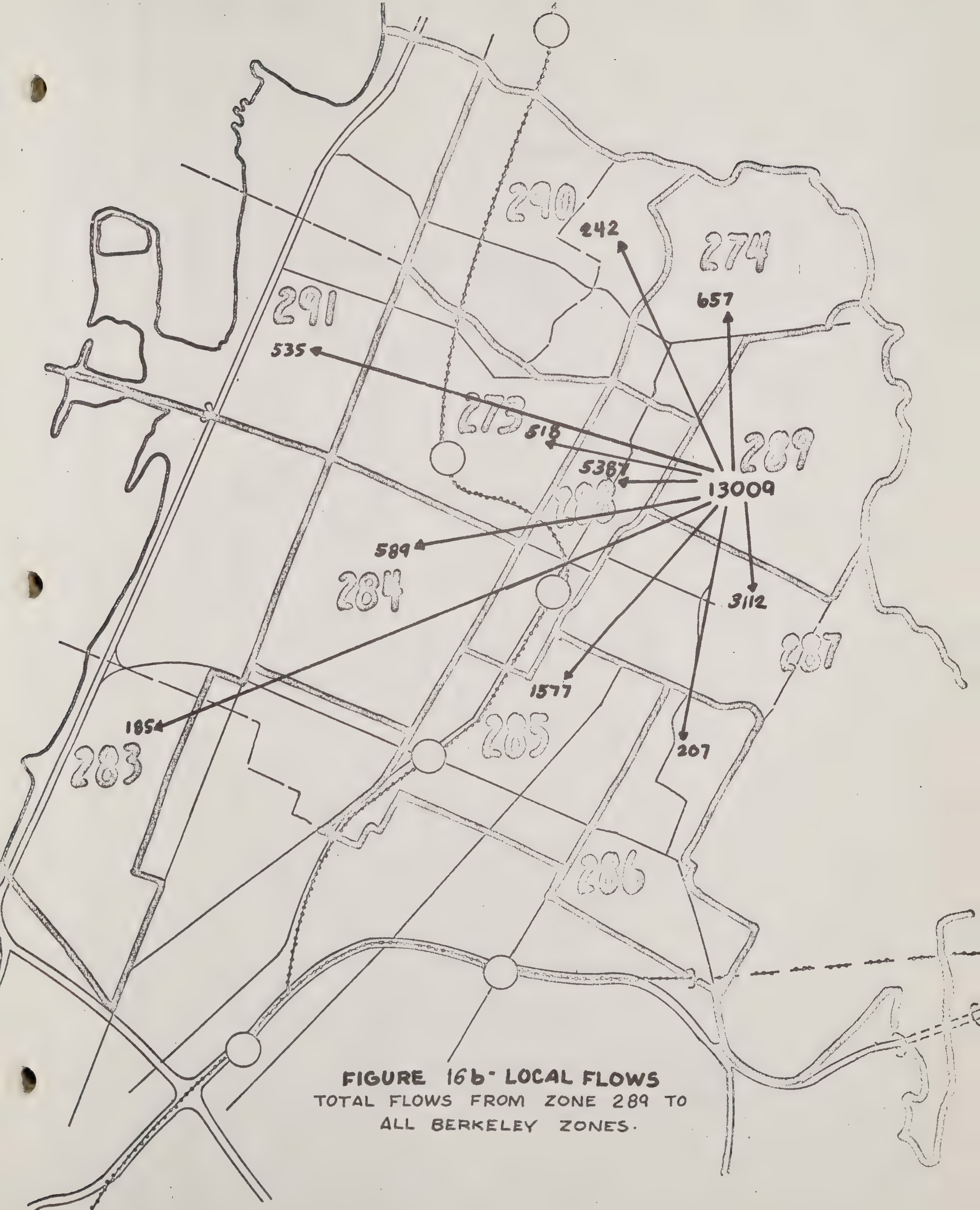


FIGURE 16b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 289 TO ALL BERKELEY ZONES.

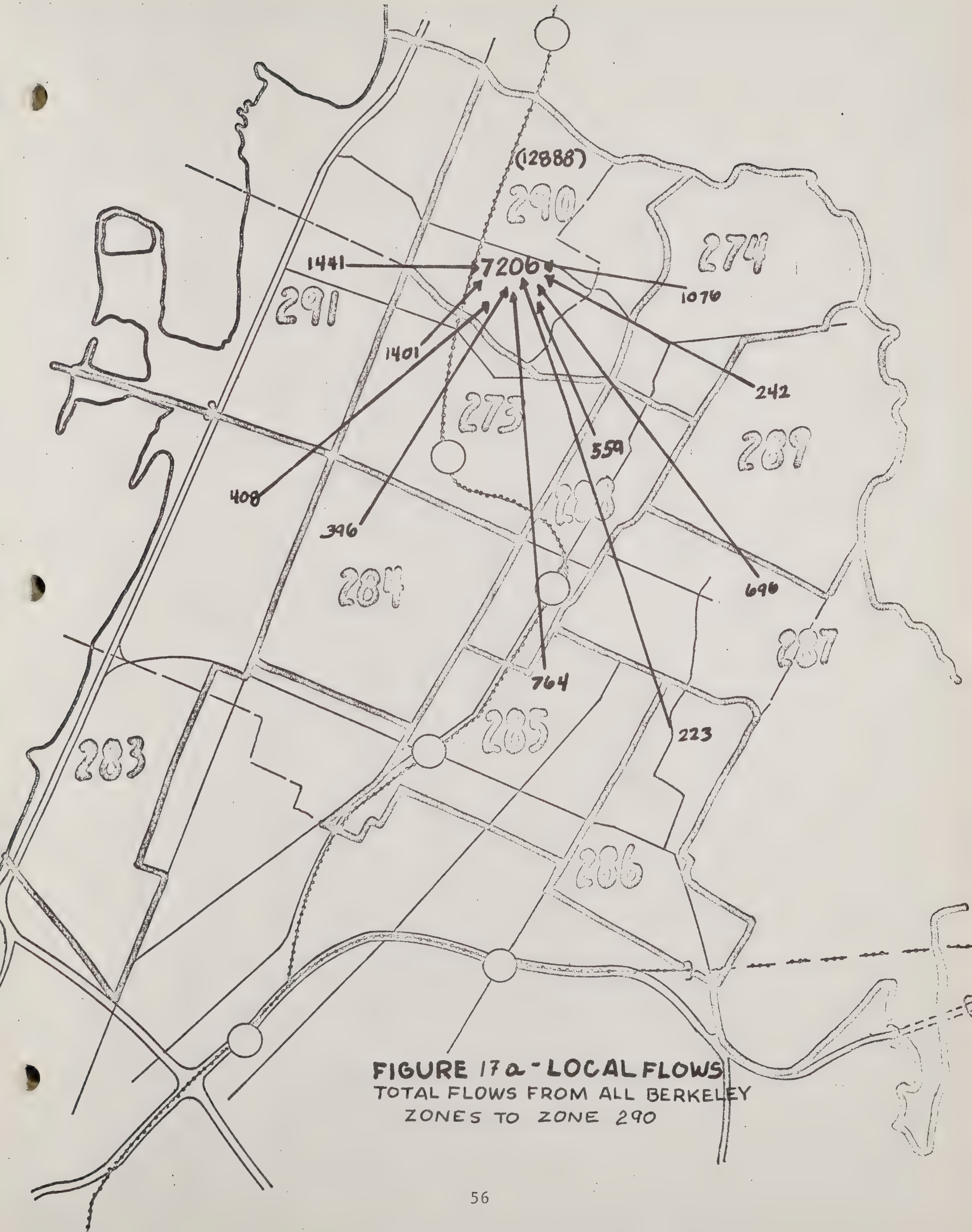


FIGURE 17a - LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY
ZONES TO ZONE 290

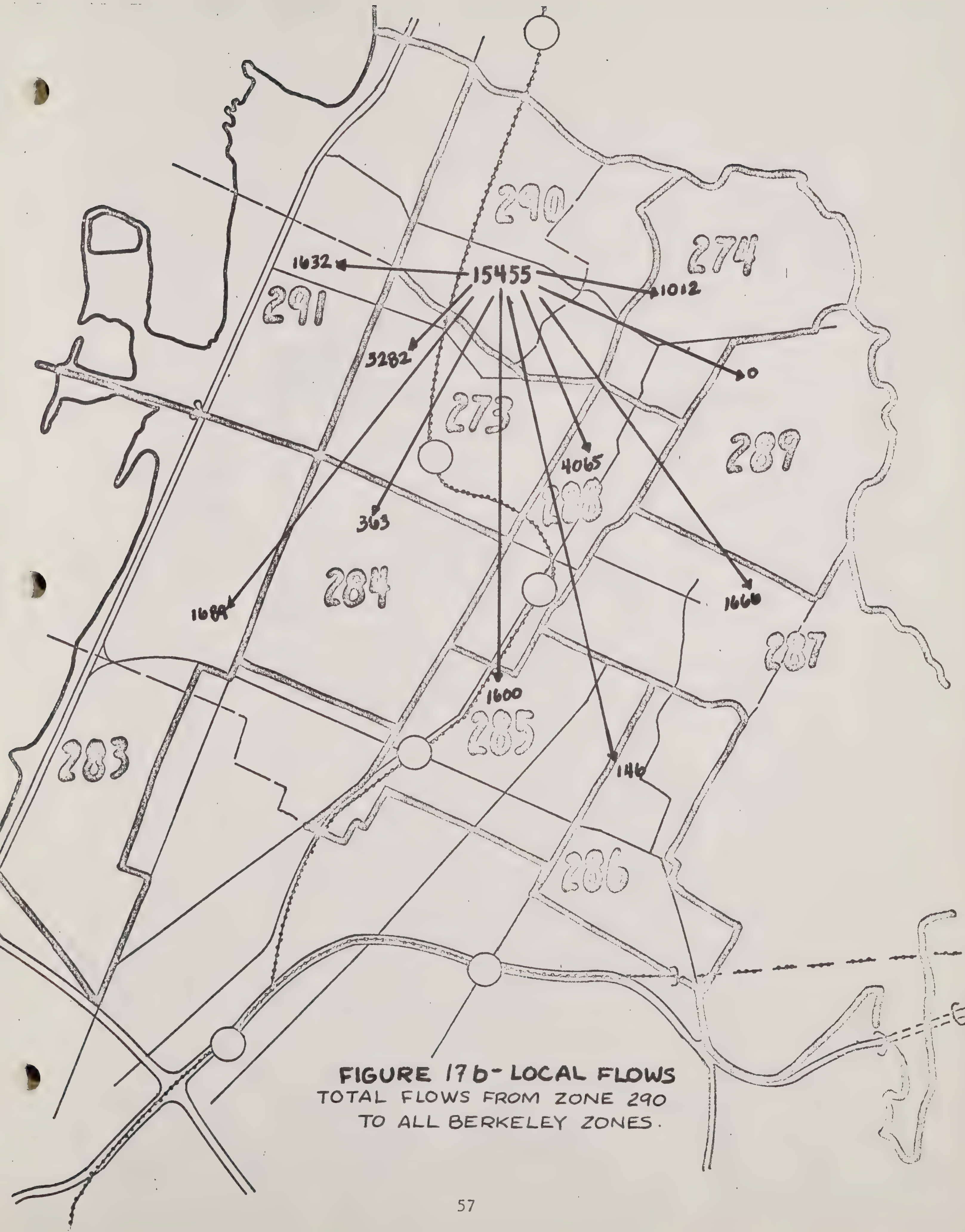


FIGURE 17 b- LOCAL FLOWS
TOTAL FLOWS FROM ZONE 290
TO ALL BERKELEY ZONES.

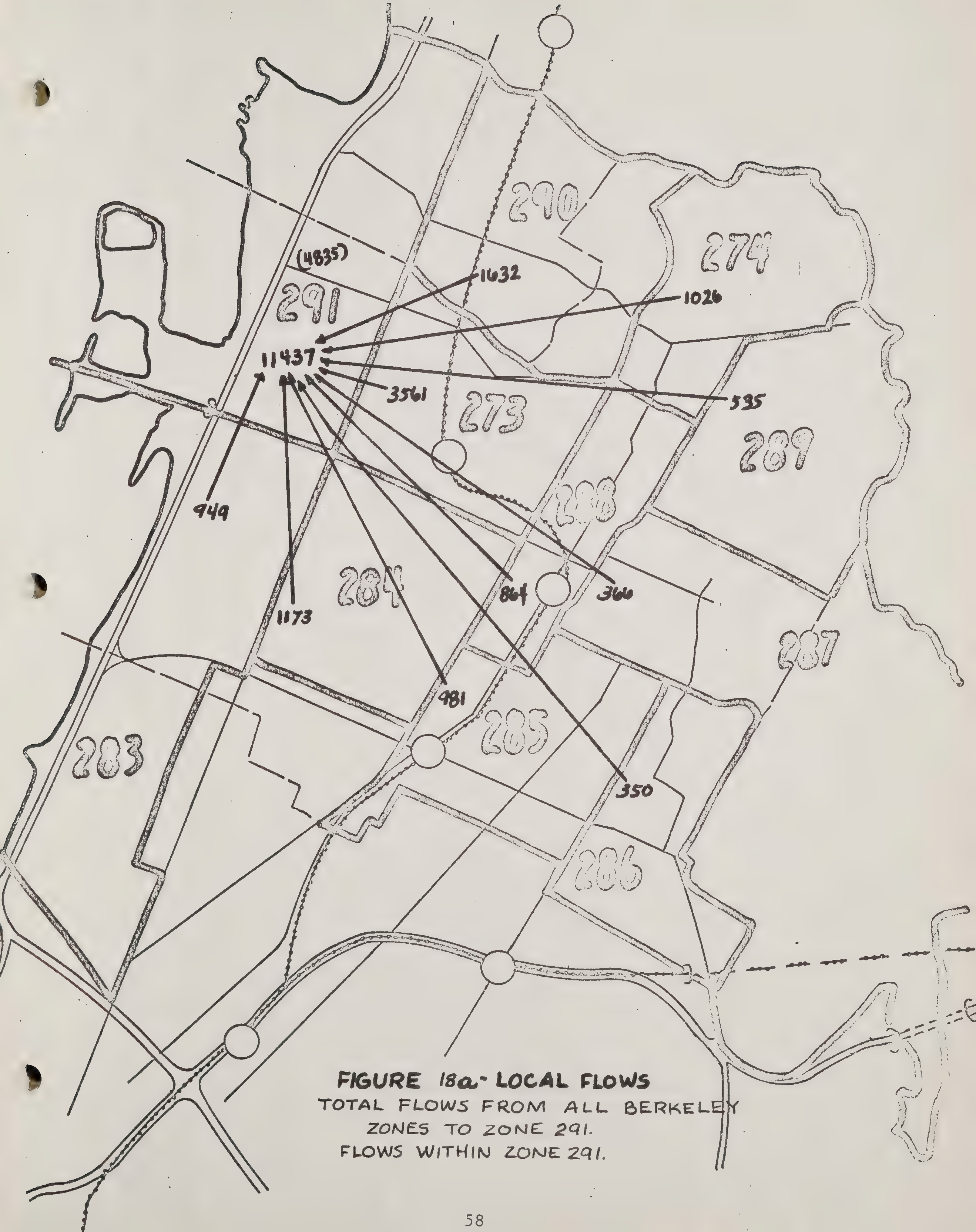


FIGURE 18a- LOCAL FLOWS
TOTAL FLOWS FROM ALL BERKELEY
ZONES TO ZONE 291.
FLOWS WITHIN ZONE 291.

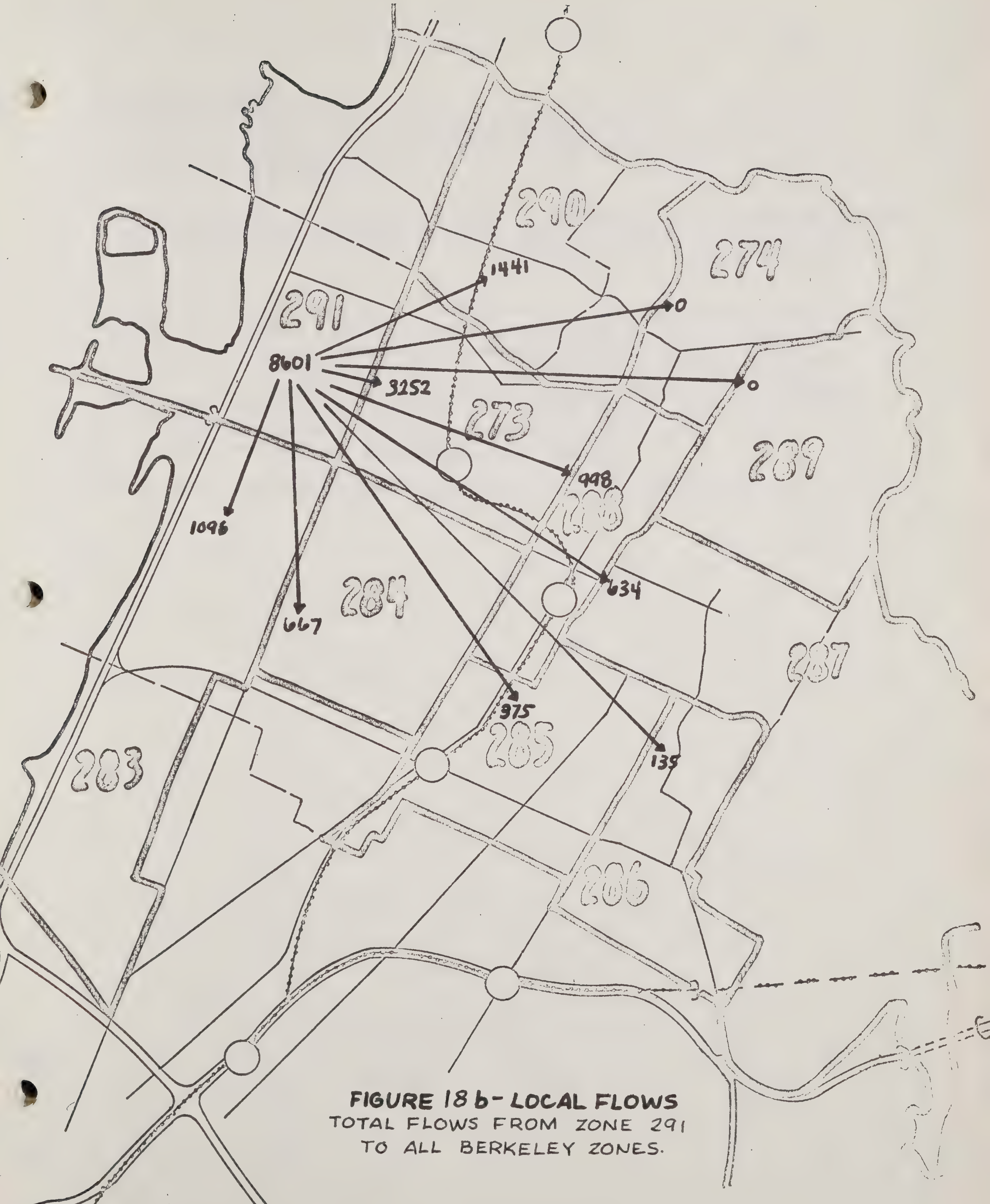


FIGURE 18 b - LOCAL FLOWS
TOTAL FLOWS FROM ZONE 291
TO ALL BERKELEY ZONES.

For the Connoisseur
For those not satisfied with gross traffic flows from each of the eight Bay Area regional zones to each of the eleven Berkeley analysis zones shown in Figures 7a and 7b, the following Tables 3 through 18 in conjunction with Figure 5 provide more information.

Figure 5 shows the location of each BATS analysis zone located in Alameda, Contra Costa, San Francisco, Marin and San Mateo Counties. Tables 3 through 18 show traffic flows both to and from all of these zones to each Berkeley analysis zone.

Tables 3 and 4 show flows for all analysis zones which were grouped into regional South Zone I. Tables 5 and 6 are zones grouped into regional South Zone II. Tables 7 and 8 are analysis zones grouped into regional South Zone III. Tables 9 and 10 are analysis zones grouped into regional East Zone. Tables 11 and 12 are analysis zones grouped into regional North Zone. Tables 13 and 14 are analysis zones grouped into regional West Zone I. Tables 15 and 16 are analysis zones grouped into regional West Zone II. Tables 17 and 18 are analysis zones grouped into regional West Zone III.

In all tables, the eleven Berkeley analysis zones are listed across the top.

TABLE 3 SOUTH I - OAKLAND-ALAMEDA CORE - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
256	99	0	142	0	65	0	0	99	0	0	0
259	0	0	1064	0	0	0	168	80	0	0	154
260	0	0	159	0	98	0	55	49	0	0	0
261	186	0	747	99	372	122	128	186	0	387	244
263	109	0	456	0	279	73	0	0	0	0	81
264	0	0	246	0	608	486	771	118	0	0	75
265	240	0	284	0	360	0	546	108	0	202	0
267	0	106	2520	61	388	0	564	188	0	0	376
268	191	328	882	0	318	0	815	820	0	164	0
269	114	99	684	463	386	413	0	194	171	0	297
271	279	0	1509	150	1050	500	1354	630	372	186	598
275	0	0	198	0	454	68	0	287	0	69	0
276	609	221	1058	514	1471	36	485	1473	52	122	633
277	298	0	2318	298	872	0	126	0	0	0	0
278	134	0	545	63	0	0	121	0	0	0	164
279	605	121	2482	1664	521	528	35	145	285	118	93
280	1126	36	1093	322	1092	581	796	1385	37	0	279
281	1278	230	1031	329	4086	1493	1994	2175	375	150	497
282	1252	58	2439	1137	3282	892	1206	2382	189	0	135
	6520	1199	19857	5100	15702	5492	9164	10319	1481	1398	3626

TABLE 4 SOUTH I - OAKLAND-ALAMEDA CORE - TOTAL FLOWS FROM BERKELEY

To ↓ From →	273	274	283	284	285	286	287	288	289	290	291
256	0	0	96	0	287	0	0	0	0	72	0
259	70	0	0	0	0	0	0	0	0	72	0
260	0	0	61	0	184	0	49	0	0	0	0
261	277	43	64	230	46	0	0	48	256	122	0
263	73	0	366	716	130	0	0	268	0	294	0
264	146	0	0	140	0	0	0	74	0	0	0
265	146	0	1	0	94	0	188	48	0	366	0
267	140	0	0	61	0	0	0	48	0	0	0
268	140	0	0	0	141	0	102	0	0	0	0
269	438	0	0	210	128	0	0	0	0	82	57
271	969	43	584	332	711	500	0	547	0	463	29
275	108	43	164	262	269	134	0	182	222	72	212
276	1387	86	1530	2167	2322	597	833	1516	111	1536	601
277	0	0	344	61	0	0	0	0	0	0	276
278	741	258	440	1274	81	92	0	0	128	0	180
279	350	43	1909	858	1003	396	51	653	191	366	461
280	324	0	441	799	690	150	103	360	222	36	175
281	35	258	167	565	1292	847	444	576	333	0	61
282	832	43	3016	2417	555	135	133	922	0	61	253
	6176	817	9183	10092	7933	2851	1903	5242	1463	3542	2305

TABLE 5 SOUTH II - PIEDMONT-STATE 13 CORRIDOR - TOTAL FLOWS TO BERKELEY

From Zone \ To	273	274	283	284	285	286	287	288	289	290	291
250	124	124	559	124	372	0	0	393	0	124	496
251	0	0	381	0	438	0	114	228	0	61	124
253	0	0	288	0	578	0	0	37	0	0	498
254	0	0	124	248	215	62	0	290	0	0	124
257	0	106	772	53	280	212	0	424	0	0	212
258	190	0	1270	0	130	0	104	201	70	0	260
266	156	156	770	242	358	104	624	522	156	104	104
270	0	84	420	42	161	0	504	252	0	0	0
272	0	174	254	116	440	561	348	58	0	0	0
	470	644	4838	701	2972	939	1694	2405	226	289	1818

TABLE [illegible] SOUTH II - PIEDMONT-STATE 13 CORRIDOR - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
250	153	0	72	0	62	0	0	48	0	0	0
251	0	0	0	0	46	0	0	48	0	61	0
253	0	0	0	0	92	0	0	0	0	0	0
254	0	0	0	61	132	0	0	0	0	0	0
257	0	0	133	70	92	0	0	96	0	0	0
258	0	172	266	70	0	190	0	43	0	204	138
266	0	0	0	122	232	46	52	156	0	0	58
270	73	0	42	0	46	42	95	39	56	0	163
272	0	0	0	0	92	374	0	0	0	72	0
	226	172	513	323	794	652	147	430	56	337	359

TABLE 7 SOUTH III - SAN LEANDRO-FREEMONT - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
227	0	0	0	0	0	0	0	280	0	0	0
228	0	0	0	0	0	64	75	0	0	0	0
229	0	0	70	0	70	0	35	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	168	0	84	0	0	42
232	0	0	67	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	42
234	0	0	0	0	0	58	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	100
236	0	0	148	109	86	0	148	109	0	0	218
237	0	0	116	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	54	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	104
240	0	0	478	0	37	116	232	0	0	0	116
241	0	0	195	0	195	0	0	0	0	0	0
242	0	0	153	0	0	0	0	0	0	0	97
243	0	0	0	0	215	0	86	86	0	0	43
244	0	0	258	0	86	0	0	86	43	0	129
245	0	0	280	0	0	0	112	0	0	0	0
246	0	0	506	0	0	0	0	0	0	0	121
247	0	0	266	0	0	0	0	0	0	0	0
248	0	0	534	0	0	0	0	0	0	0	0
249	246	0	492	0	164	0	71	37	164	0	328
255	0	0	237	179	0	0	158	0	0	0	64
	246	0	3800	288	853	406	971	682	207	0	1404
223	0	0	0	0	0	0	40	0	0	0	0
224	0	0	0	0	0	0	0	0	0	0	0
225	0	0	104	0	0	0	0	0	0	0	0
226	0	0	144	0	35	0	0	0	0	0	0
252	0	0	0	0	0	0	50	0	0	0	0
	246	0	4048	288	888	406	1061	682	207	0	1404

TABLE 8 SOUTH III - SAN LEANDRO-FREMONT - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
227	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	140	0	64	0	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0
231	0	0	532	0	0	58	0	0	0	0	42
232	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	96	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0
236	0	172	0	0	0	0	12	134	0	122	0
237	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	37	0	0
239	0	0	0	218	0	0	0	0	0	0	109
240	0	0	0	0	0	0	0	75	0	0	0
241	0	0	29	0	0	0	0	0	0	0	0
242	146	0	101	0	195	0	38	40	0	122	0
243	0	0	0	0	0	0	0	0	74	0	141
244	0	0	0	61	0	0	0	0	74	0	0
245	0	0	29	0	0	46	0	0	0	0	0
246	0	0	0	0	0	46	0	0	37	0	0
247	292	0	0	490	0	150	0	0	0	0	0
248	35	0	106	0	0	61	0	0	0	0	0
249	82	86	42	0	0	0	114	0	111	0	0
255	292	43	56	131	184	0	61	0	0	0	245
	847	301	895	1040	379	425	225	345	333	244	537
223	0	0	0	0	0	0	0	0	0	0	0
224	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	127	0	0	0	0	0	0
252	0	0	0	0	0	0	50	0	0	0	0
	847	301	895	1040	506	425	275	345	333	244	537

Table 9 EASTERN ZONE - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
137	0	0	212	0	102	106	106	265	0	0	106
138	0	0	503	74	46	0	185	518	0	0	74
139	0	43	0	86	86	129	43	172	0	0	86
140	39	0	390	39	594	195	546	274	0	39	156
141	180	36	276	46	384	79	636	300	120	0	36
142	0	0	117	273	78	0	78	270	0	0	0
143	0	0	526	0	330	123	105	70	0	0	70
144	29	0	99	0	0	83	39	30	0	0	0
145	29	0	406	0	203	141	435	145	0	174	74
146	0	0	156	0	0	0	78	0	0	0	0
147	316	0	603	222	188	0	457	141	0	94	188
148	35	0	336	152	190	38	301	114	0	0	105
149	0	0	0	0	48	0	0	0	0	48	0
150	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0
152	0	0	35	0	0	0	105	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	146
156	0	0	0	0	24	0	12	0	0	0	0
157	0	0	88	0	0	96	88	0	0	0	0
158	0	0	48	0	0	96	0	144	0	0	0
	628	79	3795	892	2273	1086	3214	2443	120	355	1041
135	0	0	0	0	0	0	0	144	0	84	0
	628	79	3795	892	2273	1086	3214	2577	120	439	1041

Table 10 EASTERN ZONE - TOTAL FLOW FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
135	73	86	0	0	427	0	73	0	296	366	29
137	0	0	38	0	93	0	0	53	37	0	0
138	0	0	133	0	107	0	35	0	0	61	70
139	0	0	0	0	0	0	0	0	0	0	0
140	0	380	0	0	232	138	144	87	111	0	0
141	0	43	74	0	155	129	108	0	0	0	0
142	0	0	0	0	267	0	0	1	0	0	0
143	0	0	0	61	92	0	150	0	0	0	0
144	0	0	33	0	292	0	0	40	0	0	0
145	0	0	0	0	138	0	102	35	0	0	0
146	73	0	0	0	92	0	0	0	0	122	0
147	0	0	168	0	0	0	39	0	0	0	0
148	70	0	0	0	436	38	35	0	0	244	0
149	0	0	29	0	0	0	0	67	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0	0
158	0	0	48	0	0	0	0	0	0	0	0
	216	509	485	61	2331	305	686	282	444	793	99

TABLE 11 NORTHERN ZONE - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
126	556	0	706	50	50	0	128	906	0	300	878
127	655	0	0	0	0	0	0	0	0	0	0
128	455	0	837	50	0	0	0	505	0	174	734
129	173	0	564	220	280	0	415	440	0	349	171
130	692	37	1943	828	1705	309	1371	1272	114	2174	1327
131	1726	1809	3059	714	1837	121	3931	6358	605	3311	1416
132	419	0	782	0	64	0	1024	192	0	64	128
133	96	0	288	457	144	0	480	672	0	234	192
134	0	0	460	184	0	0	184	605	0	106	29
136	0	0	252	0	102	0	300	0	0	0	0
159	0	0	278	0	0	0	551	344	0	97	307
160	93	0	247	0	106	46	159	53	0	0	53
	4865	1846	9416	2503	4288	476	8543	11347	719	6809	5235

TABLE 12 NORTHERN ZONE - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
126	543	43	0	61	222	0	0	43	37	42	259
127	362	0	96	0	188	0	99	294	0	1069	238
128	213	86	306	140	176	0	0	0	0	378	99
129	63	0	77	140	46	0	57	0	0	902	53
130	2643	1529	642	173	400	46	361	700	111	3746	1369
131	292	296	118	253	203	0	166	480	400	1231	37
132	0	0	78	0	0	0	0	0	99	156	0
133	73	0	0	50	130	0	102	0	0	503	196
134	92	0	0	0	184	0	0	0	0	50	128
136	0	0	58	0	0	100	0	0	0	0	0
159	70	129	257	350	360	0	182	0	175	951	67
160	274	0	0	0	46	0	0	0	0	0	0
	4625	2083	1632	1167	1955	146	967	1517	822	9028	2446

TABLE 13 WEST ZONE I - SAN FRANCISCO - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
1	0	0	136	0	118	0	135	74	0	0	0
2	136	0	175	0	387	0	70	1421	0	0	0
3	61	0	0	0	0	123	0	0	0	0	0
4	0	0	0	0	92	0	0	0	0	0	0
5	0	0	0	0	65	0	0	0	0	0	0
6	0	0	0	0	121	0	620	0	0	0	0
7	0	0	0	0	0	0	162	138	0	0	0
8	0	0	418	0	0	0	0	0	0	0	64
9	0	0	0	0	0	0	0	118	0	0	144
10	0	0	458	0	48	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	167	0	0	0	0
13	0	0	16	0	0	0	0	278	0	0	0
14	0	0	93	0	46	0	0	0	0	0	0
15	0	0	69	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	309	0	0	0	0
17	0	0	270	0	0	0	405	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	72	0	0	0	0	0
20	0	0	0	0	52	0	0	0	64	0	140
21	0	0	0	0	228	114	114	342	0	0	0
22	0	0	0	61	0	0	0	0	0	0	0
23	0	0	0	35	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	47	0	0	0
25	0	0	250	0	43	75	35	250	0	0	0
26	0	0	282	0	42	0	288	0	0	0	0
27	0	0	366	0	122	0	226	0	0	122	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	174	0	0	0	75
30	0	0	0	0	288	0	150	0	0	0	0
31	0	0	0	0	0	0	0	50	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	250	0	0	0	0	0	0	0	0
35	85	0	0	0	0	85	301	170	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0
37	0	0	103	0	0	0	42	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0
39	0	0	147	73	0	75	246	46	0	58	48
40	0	0	50	0	166	0	0	87	0	0	0
	282	0	3083	169	1818	544	3444	3021	64	180	471

TABLE 14 WEST ZONE I - SAN FRANCISCO - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
1	470	0	136	183	195	175	0	240	74	61	0
2	499	305	42	698	1096	892	271	1471	370	474	58
3	251	43	0	314	230	273	0	115	276	158	58
4	0	43	0	70	138	156	104	0	0	43	0
5	72	43	0	271	341	125	0	240	111	0	174
6	108	86	0	420	121	0	51	96	0	0	0
7	0	0	0	0	96	68	162	96	0	0	0
8	146	86	0	0	0	180	0	186	0	0	64
9	35	0	0	0	46	0	0	0	0	366	152
10	0	0	64	70	92	0	0	0	111	0	0
11	0	0	0	210	0	0	0	96	37	122	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	140	46	0	0	37	74	0	0
15	0	86	0	0	0	0	0	0	0	61	0
16	0	0	16	0	0	0	0	0	0	0	29
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0
20	0	86	0	201	144	0	0	256	0	0	0
21	35	0	0	0	0	0	102	96	0	0	0
22	0	0	0	0	92	0	51	0	51	0	0
23	73	0	0	341	0	0	53	0	0	0	0
24	73	0	0	0	46	0	0	0	0	0	0
25	0	43	36	61	0	50	35	0	0	0	0
26	0	0	0	70	0	0	0	0	0	0	0
27	73	0	29	70	0	50	0	0	37	0	127
28	124	0	0	122	0	0	0	48	0	0	0
29	0	0	0	0	0	0	0	96	0	61	0
30	0	0	0	0	92	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	103	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	96	48	0	0	0
36	0	0	0	0	0	0	0	0	0	0	29
37	140	0	0	140	194	208	0	0	74	0	0
38	0	0	0	0	0	46	0	0	0	0	0
39	289	172	0	262	785	50	79	422	74	804	138
40	0	86	130	0	0	50	0	122	0	341	0
	2388	1079	556	3643	3754	2323	1004	3665	1289	2491	829

TABLE 15 WEST ZONE II - MARIN COUNTY - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
41	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	78	156	0	0	68
43	0	1116	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	51	0	51	0	0	0	0
46	0	0	138	0	0	0	0	101	0	0	0
47	0	0	0	0	0	50	0	0	0	0	0
48	0	0	0	0	0	0	0	88	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	29	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	53	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0
55	0	0	223	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	76	0	0	0	0
	0	1116	390	0	51	50	258	345	0	0	68

TABLE 16 WEST ZONE II - MARIN COUNTY - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
41	70	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	153	242	0	0	0
46	0	0	0	0	0	0	0	26	0	0	0
47	0	86	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0
55	73	0	61	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	87	0	0	0	0
57	0	0	0	0	0	0	0	75	0	0	0
	143	86	61	0	0	0	240	343	0	0	0

TABLE 17 WEST ZONE III - SAN MATEO COUNTY - TOTAL FLOWS TO BERKELEY

From \ To	273	274	283	284	285	286	287	288	289	290	291
59	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	120	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	207	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	136	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	53	0	0	0	0
70	0	0	0	0	0	0	146	0	0	0	0
71	0	0	0	0	0	0	0	0	56	0	0
72	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	100	0	0	48	0
74	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	56	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	474
86	0	0	0	0	48	0	182	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	162	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0
58	62	0	0	0	0	124	0	0	0	0	0
	62	0	0	0	311	124	763	136	56	48	474

TABLE 18 WEST ZONE III - SAN MATEO COUNTY - TOTAL FLOWS FROM BERKELEY

To \ From	273	274	283	284	285	286	287	288	289	290	291
59	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	552	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	92	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0
66	146	0	0	70	0	184	0	240	74	0	0
67	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	53	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0
72	35	0	0	0	0	0	35	0	37	0	0
73	70	0	0	61	0	0	0	48	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	50	0	0	0	0	0
	251	0	0	131	92	234	640	288	111	0	0

Assumptions Made in Analyzing Traffic Flow Data in Regard to Claremont-Belrose-Derby

Because of the lack of some data in certain areas, I made some assumptions in order to interpret this data in a meaningful way for the Claremont-Belrose-Derby arterial. These assumptions are explained below, following which is a presentation of results from the data.

The first assumption concerned an estimation of the number of students, faculty and staff living in South Zone II.

Looking at the BATS data as presented in Figure 5a on flows from South Zones II and III to Berkeley Zone 287 and surrounding Berkeley Zones, it appears that flows coming from South Zone II are from 1.7 to almost 4 times greater than those coming from South Zone III. I used this information to make estimates on students, faculty and staff living in South Zone II.

As noted earlier, I could not get hard data on students, faculty or staff living in South Zone II, but after getting data from BATS on traffic flows from this zone, I thought it would also be desirable to make an estimate on numbers of University people living in it. Since traffic flows from this zone to zones in the University area ran from about 2 to 4 times those from South Zone III, I felt it reasonable to assume that the number of University people living in South Zone II was about twice the number living in South Zone III.

The second assumption I made concerned faculty and staff living in eastern and southern areas. As noted above, I could at this time get no complete list of addresses for faculty and staff. However, Mr. Charles Tefft, U.C. campus planner, estimated that about 11% of faculty and staff lived in Eastern Area III and between 12 and 14% in the combined South I, II and III areas. He made this estimate after checking telephone exchanges in the Campus Directory, which contains about 5000 listings of higher-paid faculty and staff. Mr. Tefft said that there was no reason to believe that percentages obtained for higher-eschelon employees would be any different from those for lower eschelon.

Data from the Parking Office (Table 2b and 2c) indicates that perhaps there is little difference in the living pattern of the two groups, at least in regard to the East Area. However, there might be a difference in regard to people living in Southern Areas. Parking permits are generally issued only to higher-income categories of faculty and staff. Lower levels have to obtain fee lot permits. For the samples I took, faculty and staff permits for the eastern area ran around 11% of the total, and for the Southern Area III around 1.5% of the total. Permits for South Area I, II, and III combined ran around 13%. When considering samples from the fee lot files, percentages from the respective areas ran 11% and 4%. The combined South I, II and III results ran 20%.

Of a total faculty and staff population of 16,000, I considered 5000 to be in the upper category and the remaining 11,000 in the lower category. For the upper category, I estimated 10% to live in eastern

areas, 1.5% to live in South Area III, and 3% to live in South Area II, because as noted above, I considered University populations in South Area II to be twice those in South Area III. I arrived at these figures considering Tables 2b and 2c, as well as Mr. Tefft's figures. For the lower category, I assumed that 11% live in the Eastern Area, 4% in South Area III, and 8% in South Area II.

Finally, of all the people living in these areas, I assumed that not all would drive to the University every day. Some would, but others might drive only once a week, others four times a week, and still others three times a week. A figure of three times a week seemed reasonable for students and faculty alike, although for staff this figure might be more arbitrary. Nevertheless, I multiplied the figure I finally arrived at for people living in affected areas by 3/5s to arrive at an estimate of the total daily flow of traffic caused by the University on the Claremont arterial.

Using the approach I have just explained, I arrived at the results outlined and explained below.

Results of Data as Applied to Claremont-Belrose-Derby

Summary

Total Students	27,000	
Faculty and staff	16,000	
est. higher paid		5000
est. lower paid		11,000

Students:

East	600	600	600
South III	270	270	270
est. South II	405	405	810
	1410	1275	1680
	(with South II twice South III)	(with South II 1.5 times South III)	(with South II 3 times South III)

Higher Paid Faculty and Staff: (5000)

East	500 (10%)	
South III	75 (1.5%)	
South II	150 (3%)	(South II is twice South III)
	725	

Lower Paid Faculty and Staff: (11,000)

East	1210 (11%)	1210 (11%)	1210 (11%)
South III	440 (4%)	220 (2%)	330 (3%)
South II	880 (8%)	440 (4%)	660 (6%)
	2530	1870	2200

Summary, continued:

Estimated Total, using mid-range figures from above:

Students	1410
Faculty and staff (upper)	725
Faculty and staff (lower)	2200
	4335

This figure of 4335 students, faculty and staff living in the East Area, South Area II and South Area III seems reasonable. The figure for students is based upon a careful random sample of all students. The figure for faculty and staff is based upon an estimate by Mr. Tefft, who took samples from the University directory, and upon parking data presented in Tables 2b and 2c.

To arrive at a figure of traffic flows caused by this figure, we multiply it by 3/5s as explained above:

3/5 x 4200 = 2520.

In addition to this figure of 2520 for University students, faculty and staff living in East Area, South Area II and III, Radiation Laboratory employees have to be considered. Rad Lab employees usually come to work each day. The location of residence for the 2800 Rad Lab employees is shown in Table 2d.

Not considering Oakland, it appears that about 1100 employees come to the Rad Lab each day from the East Area. This figure when added to the 2520 figure above, brings the total people likely to use Claremont-Belrose-Derby while traveling to the University or Rad Lab to about 3600. In both direction this would result in a total daily flow of about 7200.

During the Spring of 1969 when the count of 19,500 daily movements on Derby was made, the road connecting the Rad Lab with Grizzly Peak Blvd. was closed. At that time all employees working at the Rad Lab and living in East Area had to drive through Berkeley, most likely using Claremont-Belrose-Derby.

Now the connecting road is reopened. Mr. Coolbaugh of the Radiation Laboratory Transportation Office estimates that many people living in the East Area now drive "over the top." However, Mr. Sinemus of the City of Berkeley Public Works Department tends to minimize this number. There is certainly still a large number of cars backed up on Rim Road trying to turn onto Gayley.

How does the 7200 figure compare with flow figures for 1965 obtained from BATS? The University is contained in BATS analysis

zone 287 shown in Figure 5a. Looking at this Figure, we see that total flows to and from this zone from people living in East Zone, South II and South III totals 5879 (3214 plus 1694 plus 971).

However, BATS flows are based on surveys which were taken during the summer and which do not reflect students going to school very accurately. Consequently, if we add to the BATS figure of 5879 an estimate for students driving to the campus, we will get a higher figure. Earlier it was estimated that 1410 students live in South Area II and III, as well as in the East Area. During the summer the student enrollment is down to about 30% of normal. Thus we could guess that the BATS student component in the 879 figure has to be boosted by 70%. Taking 70% of 1410 we get 987. Multiplying by 3/5s we get 592 students likely to use Claremont-Belrose-Derby. In both directions this figure is twice as much, or 1184.

Thus we could guess that by adding 1184 to 5879 we are boosting the student component by about 70%. The sum of the two is 7063. This is the corrected BATS figure that will be used.

The figure I arrived at of 7206 and the corrected BATS figure of 7063 agree quite closely. This agreement lends further confidence that the flow of people working or studying at the University from East Area, South Area II and South Area III was in the neighborhood of 7000 people per day (3500 in each direction) last Spring. On account of the reopening of the Strawberry Canyon Road, the figure is probably now between 5500 and 6500.

Because of all the assumptions I made, considerable juggling of the figures can be made, but the same order of magnitude still results.

It is probably safe to assume that most of these people travel by car, and that they use the Claremont-Belrose-Derby arterial for access to the University, as that is the shortest and also most scenic access from the areas considered. There is some question as to how many Rad Lab employees use Claremont-Belrose-Derby or drive "over the top."

Both the BATS flow figures and the figures I arrived at above are for flows of people to and from the University. These figures would include people going by transit and people using car pools. However, transit service from these areas to the University is poor at best, and the percentage in car pools is probably small, although it might be significant for the Rad Lab. If we use the BATS figure of 1.3 occupants per car for work trips, then we come up with a figure of between 4200 (5500 people) and 5400 (7000 people)vehicles per day caused by the University and Rad Lab on the Claremont-Belrose-Derby arterial. This is between 22 and 28% of the total flow of 19,500 vehicles per day on this arterial.

Where the Traffic Goes -- The question then arises, where are all the vehicles on Claremont-Belrose-Derby coming from and going to? The answer seems to be that most come from East Area, South Area II and South Area III to the campus and central and North Berkeley with a smaller movement in the other direction. Looking again at both figures 7a and 7b, we can tally up the flows from East Zone, South II and South III to Zones 287, 288, 289, and 274, as well as the opposite movement. The results are:

(Consult Figure 7a) From Zones East, South II, South III — to Zone:		(Consult Figure 7b) To Zones East, South II, South III — from Zone:	
287	3214	287	686
	1694		147
	971		225
288	2575	288	282
	2405		430
	682		345
289	120	289	444
	226		56
	207		333
274	79	274	509
	644		172
	0		301
	12,817		3930

Total in both directions:

12,817	
3,930	
16,747	(12,600 vehicles with no transit and 1.3 people per vehicle)

Thus movements between East Zone, South II and South III on one hand and Berkeley Zones 287, 288, 289 and 274 on the other seem to account for a substantial amount of the 19,000 daily movements on Claremont-Belrose-Derby. If flows from these areas to Zone 286 are added in, the total goes over 20,000, and quite a bit over if 285 is also included. Some of the people going to 286 and 285 from eastern and southern areas would use the Claremont route. Twenty thousand people using this artery would result in 15,400 vehicles, assuming no one used transit and there were 1.3 occupants per vehicle. There are of course local users of the route, and Mr. Herman Sinemus of Public Works estimates that there are a significant number of vehicles driving over this route enroute to Richmond industrial areas.

This example is in the way of an illustration to show that most of the traffic on Claremont-Belrose-Derby can be accounted for by people

going from Eastern and Southern areas to Berkeley zones, including the University. The University alone accounts for about 21% of the traffic. I cannot say whether the remainder of the traffic would also disappear if the University were also to suddenly vanish.

Since there is interest in controlling the traffic on the Claremont arterial going to the University, the number of parking permits for people living in Eastern and Southern areas might be of interest. Calculations arriving at this information follow (consult parking data):

Parking permits		4500 approx. total
11%	East	490
1.5%	South III	67
3.0%	South II (est.)	134
		691

Fee lot permits		5000 approx. total
13%	East	650
4%	South III	200
8%	South II (est.)	400
		1250

Total:	1250	
	691	
	1941	Total with parking and fee lot permits

Thus is appears that a little less than half of the estimated 4200 students, faculty and staff living in eastern and both southern areas have parking permits. The rest who drive must find their own parking, probably in the South Campus area.

UNIVERSITY AND RAD LAB PARKING POLICY

At this time the University has about 5000 parking spaces on and near the campus, while the Lawrence Radiation Laboratory has an additional 1800 spaces. Based on ten years' experience, the University attempts to follow certain standards in determining how many spaces it needs to build. These standards include a one-to-one ratio of spaces to projected staff demand; one space for every five projected residence hall students, and one space for every 3.3 fee lot users. In a report on parking at U.C. Berkeley in November 1968, a graduate student in City Planning, Mr. James Sundberg, made the following comment:

> This standard of service represents a mixture of criteria: market demand forecasts for staff spaces which cost $84 per year; linear projections of residence hall demand at a fixed fee of $70 per school year; and deductions from oversell ratios for fee lot spaces where users now pay 50 cents per entry. Whether any of these criteria are demonstrably related to the "needs" of university-related auto drivers depends upon how this slippery term is defined. How many auto owners need to drive to the campus is a still more general and difficult question. (page 4)

In determining demand for its parking facilities, the University charges a parking fee which is high enough to make the parking system economically viable. This fee is now $84 per year, having been raised from $72 during July 1968. This fee is quite low and reflects both free land which the parking office has not had to buy, and a large number of surface lots which came into the system free of charge.

Almost all future parking spaces, however, have to be got through the erection of parking structures. Currently, the cost for spaces in these concrete shells runs well over $200 for every space for every year. This cost includes payment on debt and annual maintainance, and it is getting higher.

Mr. Frank W. Miller of the University Business and Finance Office said he would like to have three times the number of spaces now available. However, the high and rising cost of parking construction makes this dream impossible to realize in the foreseeable future, unless the cost of building parking structures is subsidized, perhaps by the State.

Therefore, the philosophy is to build as many parking spaces as possible within the funds available. The outlook is that new parking structures will have to be financed from parking revenues, and that parking fees will have to be raised to accomplish this.

This bind acts as an unintended damper upon parking construction and use. However, its effect is only partial, as in many places there are no alternatives to automobile use.

Thus, there is the situation where parking fees were raised from $50 to $72 in 1963 or 1964. A 30% drop in faculty permits resulted.

However, these people all came back after a year or two, because of the lack of substitutes.

Another raise of $1 per month occured during July of 1968. This increase resulted in no significant drop in the number of permits.

For a point of reference in the cost of providing parking, Mr. Miller suggested one look at San Francisco. There, he said, parking costs $2.25 per day. This cost reflects the total and true cost of providing parking in San Francisco.

In downtown Berkeley, parking costs have just risen from $15/month to $18/month on lower levels of garages, and from $12.50 to $15 on the top levels. Faculty and staff on the campus now pay $7 per month.

Radiation Laboratory parking is provided free of charge, although a person has to obtain a permit in order to make use of it. I do not know what standards are used in deciding how many spaces to build; however, with 1800 spaces for 2800 employees, there appears to be an attempt to build enough space for everybody who wants to drive or use a car pool.

The main University also uses a system of permits to regulate the use of its 5000 spaces, as more people are willing to pay $84 a year for spaces than there are spaces available. Students and some staff wishing to park near the University in University lots can obtain a permit free of charge to use the fee lots. It costs 50¢ per day to use a fee lot. Higher level personnel apply for the $84 yearly permits. Residence Hall occupants can apply for a $70 yearly permit.

The system of permits differs between the University and the Radiation Laboratory, as parking in these two facilities is administrated through different offices. Basically, however, the issuance of a parking permit in either facility does not represent a need to drive, but rather a degree of status in academic or administrative standing. All academicians and administrators above a certain salary level are eligible to buy or obtain a permit.

It is only after academic and administrative personnel above the cutoff salary level have taken first choice of parking spaces that lower status personnel can apply to buy or obtain the remaining spaces. In the University, these spaces are allocated on the basis of a point system. An applicant earns points again largely through the size of his salary, by his years of service, distance from campus, distance from public transportation and propensity to group with others into a car pool.

For the University, distance from the campus and distance from public transportation play a very small part in contributing to an applicant's points. For example, a person living more than one mile from the

campus, but within ½ mile of public transportation (which presumably goes to the campus), is awarded 2 points. On the other hand, if he makes $7368 a year, then he is awarded 10 points, or if he regularly brings three or more passengers four days a week, he is awarded 6 points.

Thus, University parking policy in issuing permits is not based largely on a need to drive in getting to the campus, but on standing within the University community. If the University were to encourage people not to drive to the campus, it would issue almost all permits on a point basis. Points would be issued according to a person's distance from campus, his distance from public transportation which goes to campus, and his desire to form car pools. This arrangement would place heavy emphasis on these criteria, with little on salary level.

For instance, a person living from 0 to ½ miles from campus might receive 0 points; ½ mile to one miles 2 points; one mile to two miles, 5 points; more than two miles, 10 points. However, if this person lived within ½ mile of good public transportation going to the campus, then he might receive 0 points for all cases. In addition, if the person were in such a position that he could easily drive two or three miles to good public transportation to the campus, then he might also be awarded only 1 or 2 points. An example would be a person living in Walnut Creek, driving to the BART station, and using BART to get to campus via a good shuttle system from Rockridge.

Six points for regularly carrying three or more passengers could still be awarded in order to encourage car pools for those people who cannot make use of good public transportation.

This type of permit system as outlined in the above illustration would encourage the use of alternatives to the automobile in reaching the campus if these alternatives were available. At present, however, the University does not have such a policy. The University policy is to build spaces for all those who want and can pay for them, and if that is financially impossible, then issue permits only to the higher salaried employees.

Strange as it may seem, this policy has had somewhat of an anti-automobile effect. With the moritorium because of financial reasons on new parking construction over the past several years coupled with increasing parking fees, auto usage to the campus at least by students has declined. Housing Office data show that the 5500 students now driving to the campus each day has remained about the same over the past several years, and is considerably down from the 1958 high of 6800 students. This steadiness occurs in spite of a considerable increase in student enrollment over that period. During the same period, car pool usage increased from 2.2% to 4.5%, public transit riders increased from 5.8% to 6.2%, and cyclists increased from 5.8% to 6.2%.

PUBLIC TRANSPORTATION IN BERKELEY

Transit in Berkeley is basically of two types. The first type is designed to provide transportation for special and specific purposes. The second type is designed to provide general transportation throughout the day for anybody who might want to use it for any of a variety of purposes.

Examples of the first type include Berkeley school bus operations and certain commuter operations of A-C Transit. Examples of the second type include the bulk of bus service operated by A-C Transit.

Distinguishing between these types of service is important. What might be considered to be good service for one purpose might very well turn out to be bad service for another purpose.

Specialized service is generally provided for a category of people who make the same pattern of trip movements day after day. People going to work or to school satisfy this requirement. Their movement is predictable, and since large numbers of them move at the same time often between the same points, a vehicle can be provided to move them when they want it. There is no need for a bus service that runs frequently throughout the day for these people. All they need is a bus for when they leave home, and another one for when they return.

On the other hand, many trips are not predictable. These types of trips are caused by the housewife who suddenly decides she has to go shopping, or by the family that decides to go to the park. If these people are to use public transportation, they will want a bus to be close by them, they will not want to wait long for it, and they will want it to go where they wish.

These desires are not different from those of people in the first category. However, since the demand for travel is now no longer predictable, a supplier of transportation can no longer provide one well-placed vehicle to meet demand. He must instead provide a very dense network of transportation lines with vehicles running over them very frequently throughout the day and night.

Public transportation is making some progress to compete with the automobile in the first category. Some agencies such as A-C Transit have sought to identify specialized demands and to provide attractive services that might compete with the automobile to meet these demands. BART hopefully will improve the entire transportation picture. It will certainly further improve specialized rush hour transportation.

Progress in improving public transportation for the second category is not as easy. Yet, such progress must be made if an alternative is ever to be found for the automobile.

This section of the report presents a summary of transit facilities as they now exist in Berkeley. These facilities include A-C Transit, the Berkeley school bus system and services provided by the University. In addition, Greyhound operates a couple of trips a day in each direction between Berkeley and the Orinda-Walnut Creek area.

A-C Transit Service
(From information supplied by E. Sam Davis, Planning Director, A-C Transit)

A-C Transit provides good rush hour service to several areas. Service is best to downtown San Francisco from many parts of Berkeley. It is also good to downtown Oakland and to downtown Berkeley.

Usage of A-C Transit is considerably lighter during the rest of the day. This generalized service is probably used mainly by those who do not have the use of an automobile, because in most cases the quality of this service is considerably below that which could be provided by a car. Nevertheless, the quality of this service is superior to that found in many other American urban areas; consequently, its usage is greater.

Figures 19a, b, c, and d show the extent of A-C Transit service in Berkeley. Tables 19a and 19b provide a concise summary of operating results on various Berkeley lines. The routes of these lines are identified in Figure 19.

Table 19a tells where the various lines go outside of Berkeley. Table 19b in conjunction with Figure 19, is an attempt to portray the quality of service provided by the various lines on an average weekday, Saturday and Sunday. The revenue of each line gives an indication of its patronage. Since the cash fare was 25¢ and the token fare was 20¢ during the Spring of 1969 when these figures applied, multiplying the revenue figure between four and five gives an idea of the number of people who boarded the bus. However, these figures in all cases will be depressed, since this method does not take into consideration transfers. All lines receive transfer passengers from other lines, and these are not shown in the revenue figures. On some lines the number of transfer passengers is not too significant in relation to the revenue brought in. But on other lines, such as the 7 Line, it is very significant.

Other columns give the route speed and frequency for the various lines during the day. The route speed tells the average speed of the bus in traveling from one end of the line to the other. Frequency tells the average time between buses during the morning rush hour (am), middle of the day (mid), evening rush hour (pm), and evening (nt).

Table 19a

A-C Transit Line Route Descriptions

Route	Where it goes
E	Claremont Hotel to San Francisco via Claremont Avenue.
F	Albany and Berkeley to San Francisco via Shattuck.
Fx	Euclid-San Francisco Express via Shattuck, Stanford and freeway (rush hour).
Fxx	Berkeley-San Francisco Express via University and freeway (rush hour).
7	Arlington-downtown Berkeley-Euclid-Grizzly Peak local.
15	Berkeley-Oakalnd-East Oakland via Grove.
17	Alcatraz and Adeline-College and Claremont-Chabot shuttle
33x	Berkeley-Oakland express.
40-41	Berkeley-East Oakland-San Leandro via Telegraph
43-43A	Albany-Berkeley-East Oakland-San Leandro via Shattuck and then Telegraph
51-58	Berkeley-Oakland-Alameda via College and Broadway
65	Dwight-Claremont-Ashby local
67	Colusa-downtown Berkeley-Spruce-Grizzly Peak local.
72	Richmond-Oakland via San Pablo
73	Waterfront to Oakland via 6th (rush hour only).
88	Berkeley to West Oakland via Sacramento and Market.
G	Thousand Oaks-San Francisco (rush hour only) via San Pablo.
H	Arlington-San Francisco via Sacramento (rush hour).

Figure 19 a.

A-C Transit Lines in
Berkeley
Weekday Service
Spring 1969

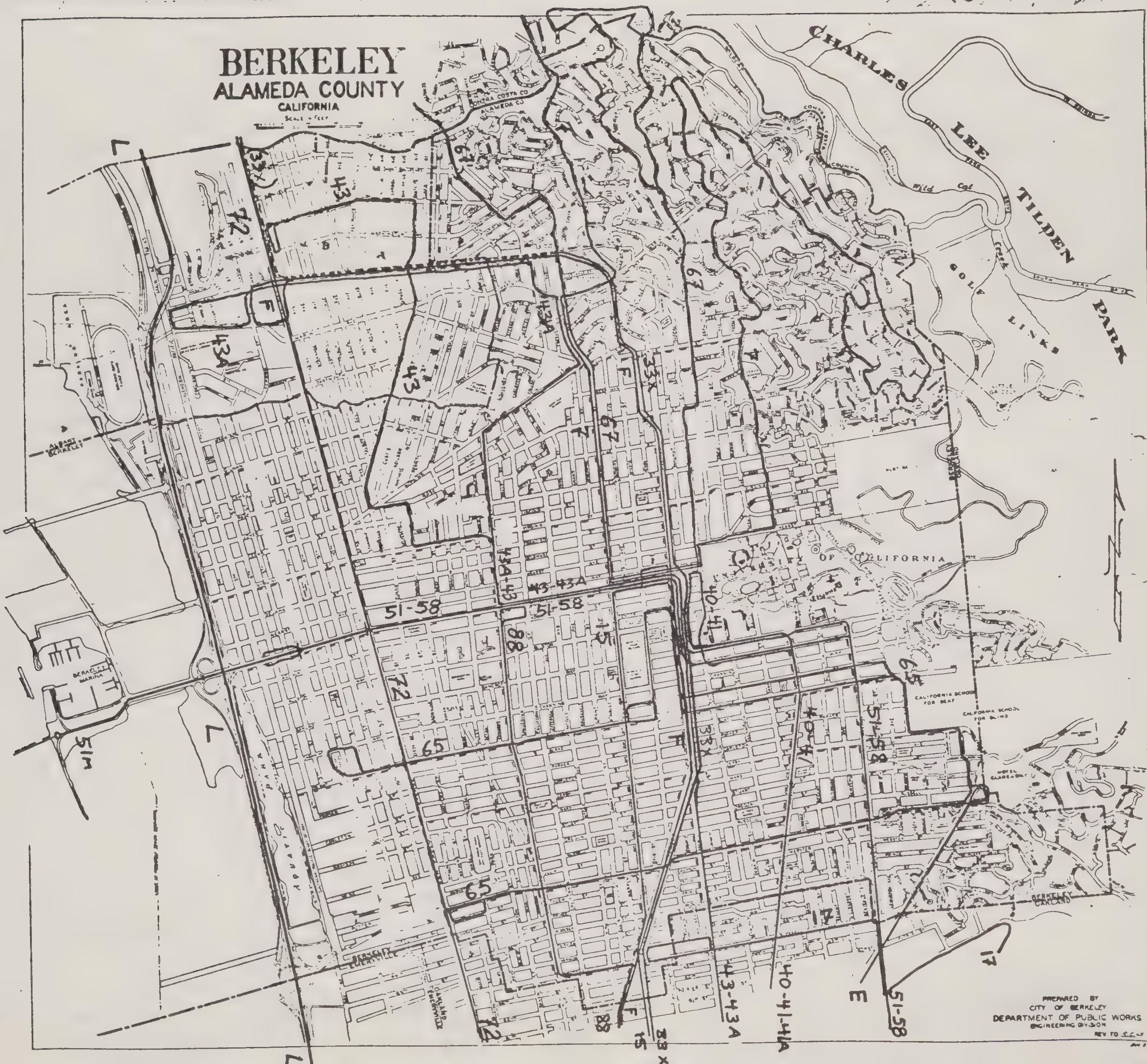


Figure 19 b.

A-C Transit Lines in
Berkeley
Additional Service
during rush hour.

All lines run more frequently during rush hours. In addition, these extra services are provided.

There are probably other, even more exotic services which are not shown here.

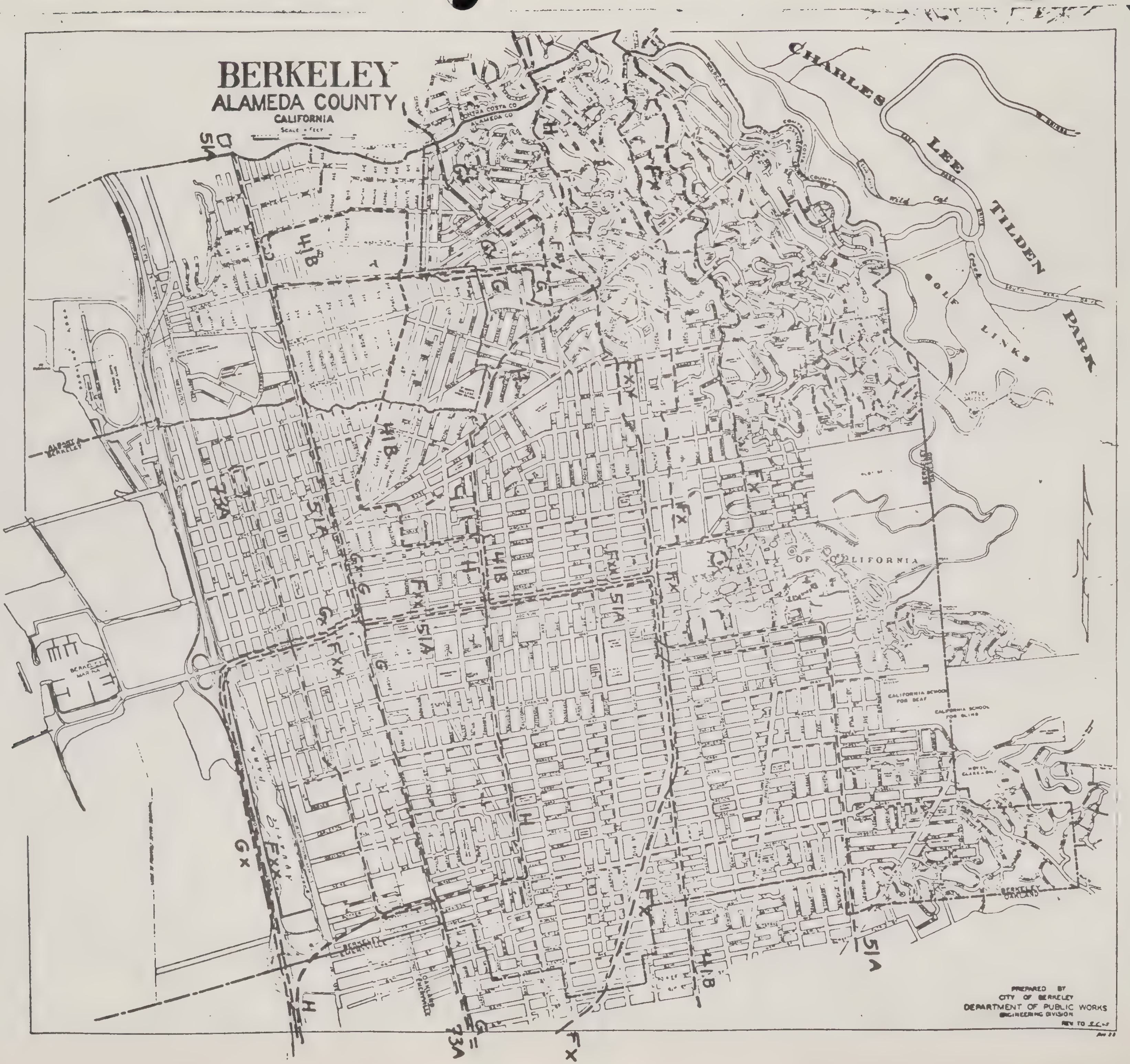


Figure 19 c.

A-C Transit Lines in Berkeley Saturday Service

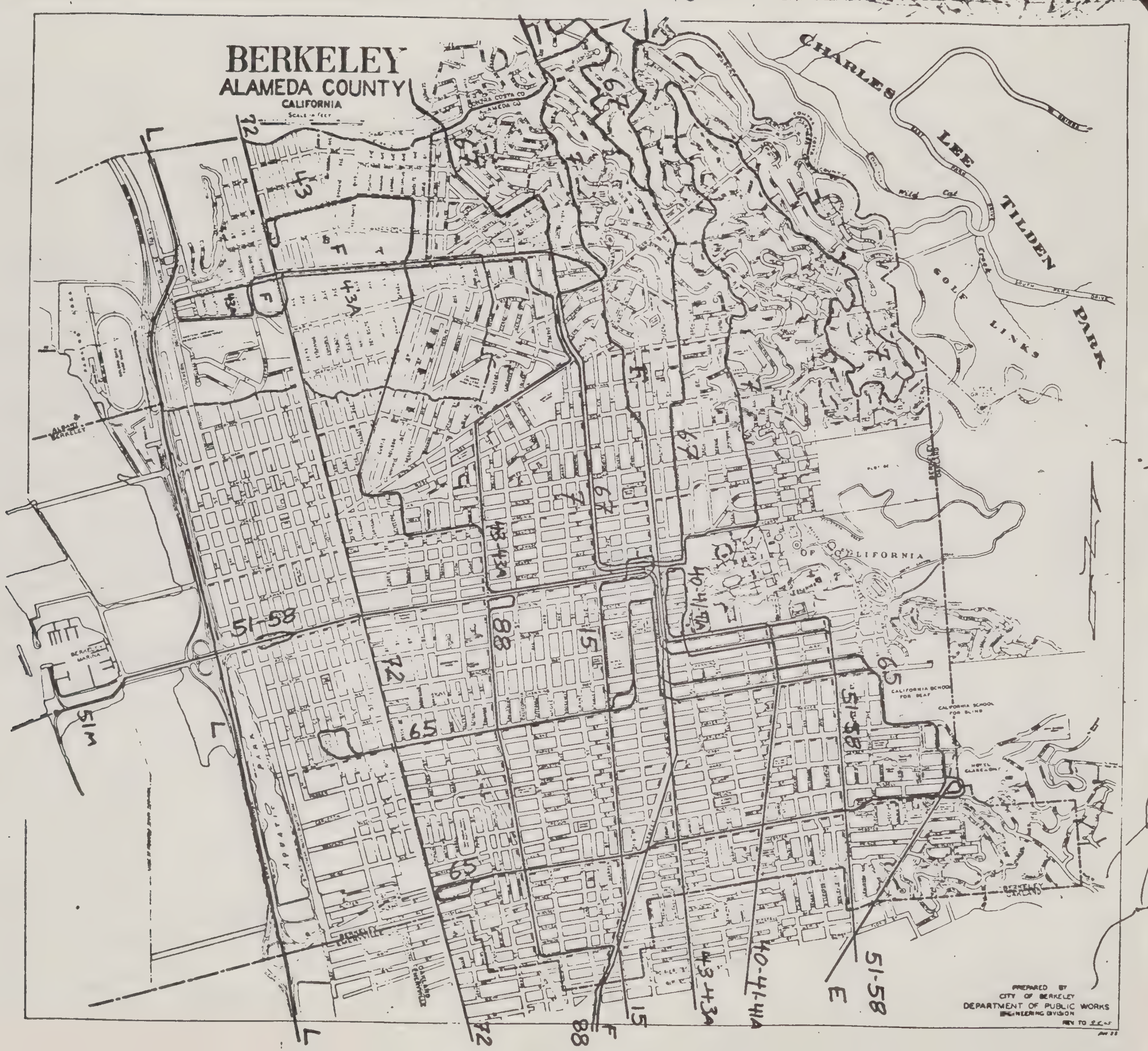


Figure 19 d.

A-C Transit Lines in
Berkeley
Sunday Service

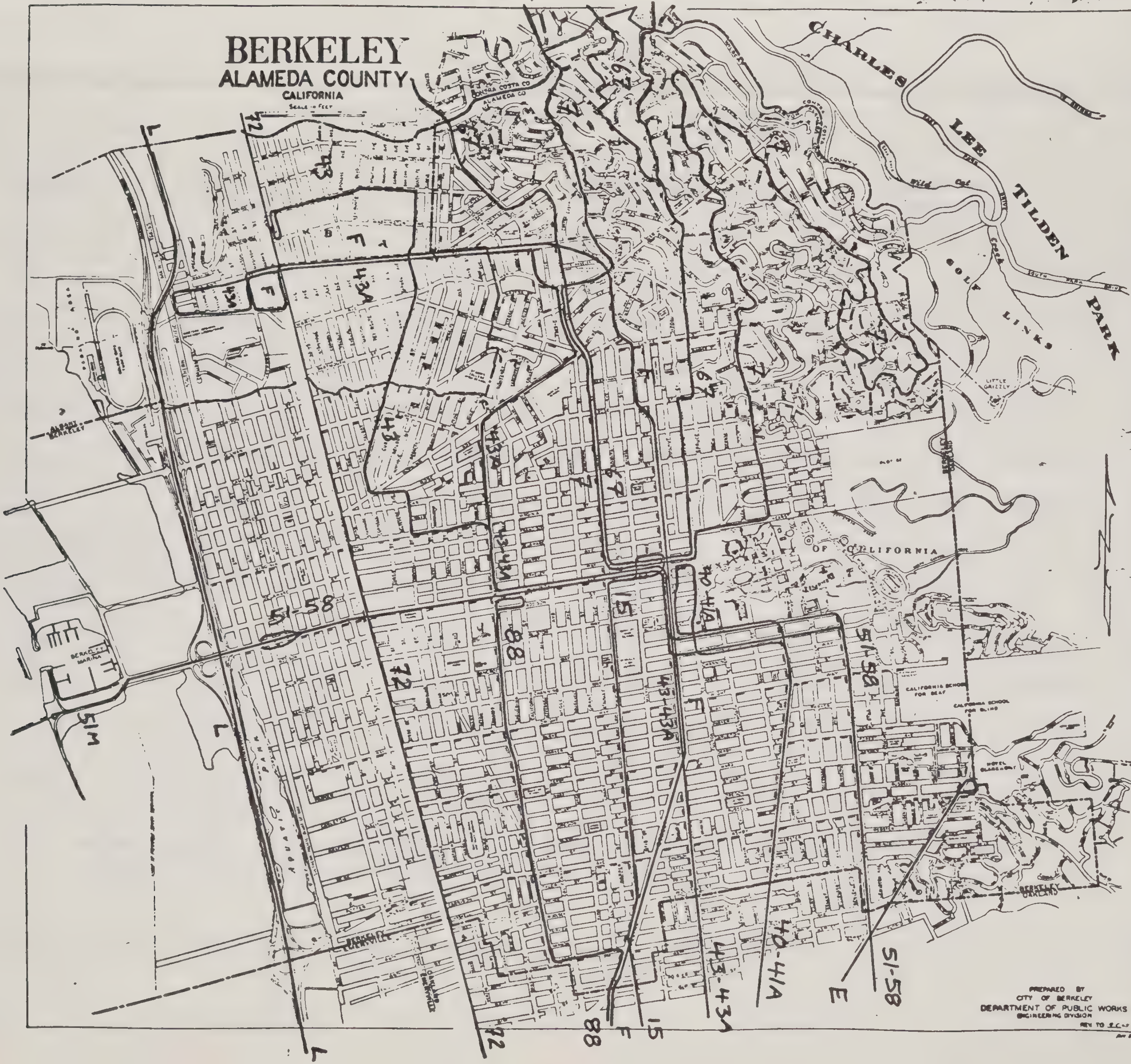


Table 19 b
A-C Transit Line Characteristics---Weekday*

Route	Miles operated	Revenue (dollars)	Route speed (mph)	Frequency (minutes) am	mid	pm	nt
E	1428	1140	22.8-25.4	6	30	5	60
F	3665	3610	21.2-26.8	3½	15	3	20/30
7	1145	419	12.5-14.7	12	30	15	30
15	2570	1680	9.9-10.7	7	10	6	30
17	Do not have this information			20	40	20	none
33x	1256	767	12.9	8	15	17	none
40-41-43	5330	3830	9.5-10.3	4	7½	5	15
51-58	3830	3530	9.2-9.7	6	7½	6	15
65	474	232	10.7	20	30	20	none
67	895	309	12.0-14.2	10	30	10	30/60
72-73	3300	2401	12.7-14.9	6	10	4	15/20
88	1163	936	11.0	12	15	10	30

*Revenue figures are averages for the week April 21-25, 1969.
Other figures are applicable for June 1969.

Table 19 b
A-C Transit Line Characteristics---Saturday*

Route	Miles operated	Revenue (dollars)	Route speed (mph)	Frequency (minutes)			
				am	mid	pm	nt
E	515	276	25.4	45	45	45	60
F	2354	2210	22.9	12	12	9	20
7	625	157	12.5-13.5	30	30	30	30
15	2025	1152	9.9-11.1	10	10	10	30
17	No Saturday Service						
33x	No Saturday Service						
40-41-43	4555	2866	10.2 -11.1	10.	10	6	15
51-58	2950	2200	9.4-11.6	11	10	10	15
65	356	89	11.3	30	30	30	none
67	560	158	10.4-13.0	30	30	30	30/60
72	2730	1935	14.6-16.0	10	10	10	15/20
88	945	770	10.4-11.2	20	15	15	30

*Revenue figures are averages for April 19 and April 26, 1969.

Table 19 b

A-C Transit Line Characteristics---Sunday*

Route	Miles operated	Revenue (dollars)	Route speed (mph)	Frequency (minutes) am	mid	pm	nt
E	417	187	25.4	60	60	60	60
F	1681	1362	22.9	20	15	15	20
7	449	77	12.4-13.5	40	30	30	30
15	1176	574	12.5-13.6	30	20	20	30
17	No Sunday Service						
33x	No Sunday Service						
40-41-43	3687	1604	11.0-12.0	15	10	10	15
51-58	2438	1228	10.9-12.9	20	12	12	15
65	No Sunday Service						
67	604	97	14.2	30	30	30	30/60
72	2125	1103	14.7-17.6	20	15	15	15/20
88	724	430	12.2-14.1	20	20	20	30

*Revenue figures are averages for April 20 and April 27, 1969.

Berkeley School Bus System

The Berkeley School District operates an extensive specialized bus system to facilitate integration of its schools. Generally, the black population lives in the flat lands in the western part of the City, while the white population lives in the hill areas in the eastern part of the City. The central section is somewhat integrated.

All children attending grades kindergarten through the third grade must attend schools which mostly are located in the hills. All children attending grades fourth through sixth must attend schools which are located on the flats. Older children attend junior high and high schools. These children are not included in the busing program.

This pattern of schooling results in a need to provide transportation to take a large number of children from one part of the City to another. Figure 20 shows the bus pattern that results.

The four large black stars lettered A through D are the four fourth grade through sixth grade schools (4-6), all of which are located on the flats. Children in the fourth, fifth and sixth grades who live in the neighborhoods of these schools are expected to find their own transportation to get to them. However, children in these grades living far away in the hills are expected to use a school bus to get to these schools.

There are 24 school bus routes in the hills to take children to the four 4-6 schools in the flats. These routes are shown as solid black lines in Figure 20. The letters (A,B,C, or D) next to each line shows to which school that bus goes. At about 8 or 8:05 each morning 24 buses will begin picking up children on each of the 24 routes. When each of the buses gets to the arrowhead at the end of each of the lines, it will pick up no more children, but rather it will then operate express to the school to which it is supposed to go. All buses arrive at the four schools (A, B, C, or D) at around 8:25. School for fourth through sixth grades begins at 8:30. These buses are then in position to pick up kindergarten and first grade children bound for their schools in the hills. Their classes begin at 9:00.

The nine large black dots numbered 1 through 9 show the locations of the nine kindergarten through third grade schools, most of which are located in or near the hills. Children in kindergarten and in the first, second and third grades who live in the neighborhoods of these schools are expected to find their own transportation to these schools. However, children living farther away, mostly in the flats, are expected to use a school bus in getting to these schools.

There are 15 school bus routes, mostly in the flats, to take children to the nine K-3 schools, mostly located in the hills. These routes are shown as broken black lines in Figure 20. The number (1 through 9) next to each line shows to which school that bus goes.

Figure 20.

Berkeley School Bus
Routes
1968-1969

With the school schedule shown below, many of the buses run throughout the day:

Morning kindergarten	9 a.m. to 11:35 a.m.
Afternoon kindergarten	12:45 p.m. to 3:20 p.m.
Some grades 1, 2, 3	9 a.m. to 2:10 p.m.
Remaining grades 1, 2, 3	10:10 a.m. to 3:20 p.m.
Grades 4, 5, 6	8:30 a.m. to 2:50 p.m.

The heaviest loads result in taking the 4-6 children to school at 8 a.m., and in bringing them home at 2:50 p.m.

Between 3500 and 3600 children are carried per day on this system at a cost of about $260,000 per school year. Over one half of this cost is paid by the state.

Service is provided by 10 school district vehicles supplemented by 20 buses which a contractor provides. Capacity of the buses ranges from 12 to 91 children. Drivers work a 4 or 8 hour day and are not paid for long breaks between some of the runs.

The contractor's buses and the district's buses are assigned to specific routes. Vehicles are assigned so that capacity is sufficient to meet heaviest demand, which occurs twice a day. Vehicle assignments are changed periodically to reflect changing demand conditions.

A-C Transit was considered in providing this type of bus service. However, the District finally decided in favor of a contractor. Mr. Rhodes of the School District's Office of Transportation, said there were several reasons for this decision. These included:

1) Earliest classes would have to be pushed back an hour or more so that A-C Transit's rush hour equipment would be available.

2) A-C Transit buses would have to be dead-headed back from San Francisco, thereby adding to costs.

3) A-C Transit buses are not school buses. They are not painted yellow. The seats are 32 inches wide rather than a school bus's 36 inches. Three children cannot fit easily on an A-C Transit seat.

A-C Transit, however, does provide a substantial amount of service for older children going to secondary schools.

Lawrence Radiation Laboratory Bus Service
(Interview with Warren Coolbaugh, Business Services Department, LRL, on August 21, 1969)

There are approximately 2800 regular employees at the Lawrence Radiation Laboratory. In addition, there is a small number of employees at the Lawrence Hall of Science, which is not connected to the Radiation Laboratory in any administrative sense.

These 2800 employees can enter the facility either by driving via routes through Berkeley, or via routes "over the hill" on Strawberry and Grizzly Peak Roads. They can also reach the facility by public transit to the main campus, and thence a Rad Lab bus which runs around the campus and then up and through the facility.

The majority of these poeple come to work around 8a.m. and leave around 5 p.m. There is one shift of around 1000 in number which starts at 7:30 a.m. and finishes at 4:30 p.m.

In addition to these trips, more than 15,000 non-employee vehicles enter the facility every month. These vehicles include delivery and service wagons, visitors and "curiosity seekers."

The Radiation Laboratory administers its own parking facilities, as well as transportation between the Rad Lab, campus and downtown, and internal transportation within the facility. Circulation within the Rad Lab is accomplished either by this free provided transportation, or by private automobile.

About 300 graduate students, among others, make use of the Rad Lab bus to travel between the campus and the Lawrence Radiation Laboratory facility. Amother small bus runs between Hearst Mining Circle on the campus and the Lawrence Hall of Science.

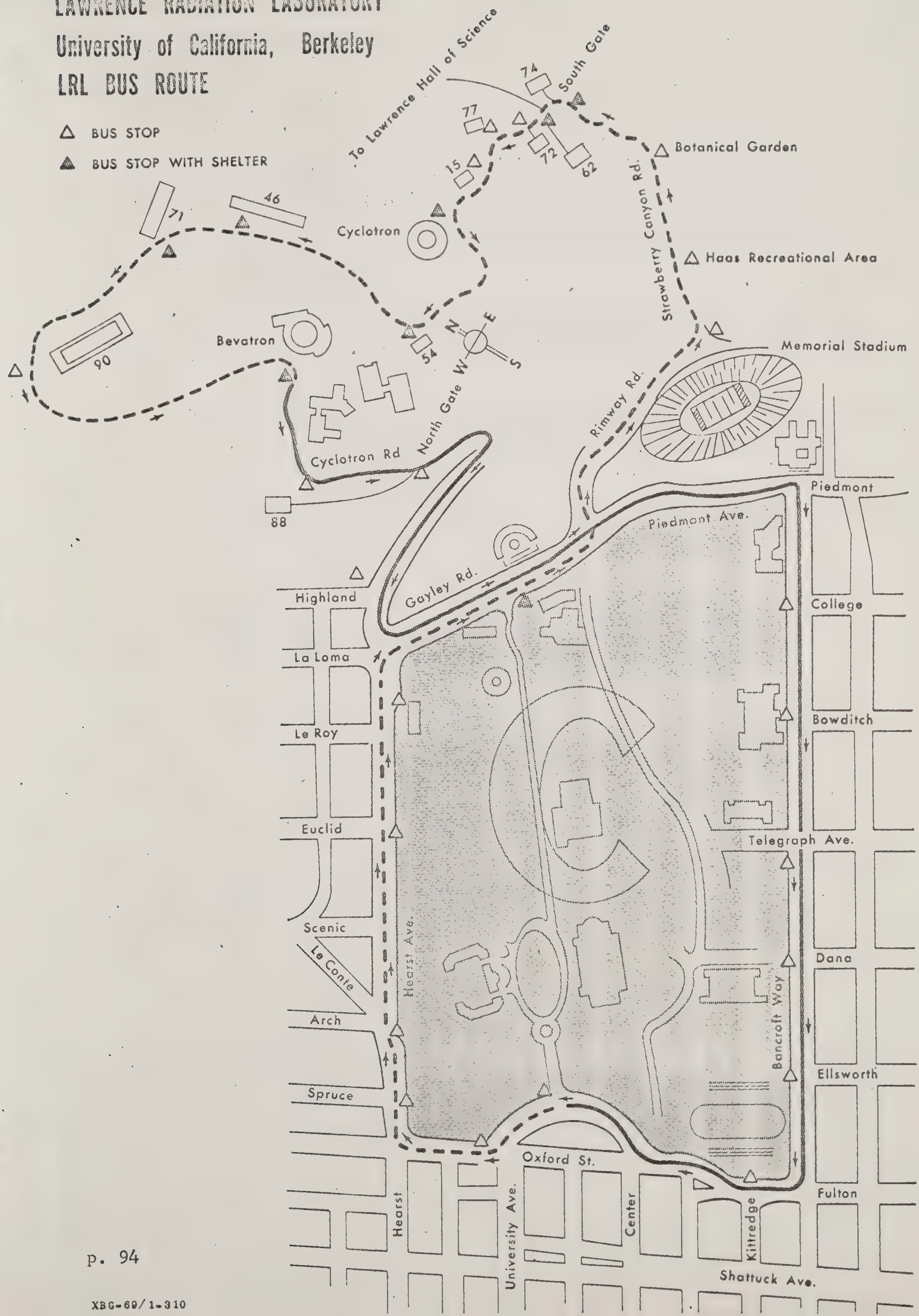
For internal trips within the confines of the fence, an "on-project" taxi service is provided.

The regular Rad Lab bus operates on the route shown in Figure 21. This route runs clockwise around the campus, and counter-clockwise through the facility. At Donner Station near the corner of Gayley and Campus Rd., both buses going up to and coming down from the hill stop. The route is such a length that one bus can make a complete circuit in somewhat less than half an hour.

To provide the bus service, the Rad Lab contracts with the University Garage for the provision of equipment. The garage charges $90 per month rental for the provision of one full-time 35-passenger bus with a second bus available for additional service. In addition, the garage charges $0.25 per mile of operation. These figures cover capital costs, servicing and

FIGURE 21

LAWRENCE RADIATION LABORATORY
University of California, Berkeley
LRL BUS ROUTE



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maintenance. The Rad Lab must provide its own labor.

One bus operates continuously from around 7 a.m. to 6 p.m. Monday through Friday. It provides service with half-hour frequency on the route shown in Figure 21. In addition, a second bus offers rush-hour service from 7 to about 8 in the m orning, and 4:30 to about 5:30 in the afternoon. This bus operates counterclockwise both through the facility and around the campus. It does not operate along the east edge of the campus on Gayley Road.

For the basis of mileage payments, the Rad Lab and the University Garage agreed upon, through negotiations, an average daily mileage of 145 miles.

Drivers to operate the buses must be provided by the Rad Lab. The Lab uses its own employees to drive the regular bus. It hires student employees to operate the extra trips during the morning and afternoon.

Cost of operation is $233 per day, according to Rad Lab figures. This breaks down to $80 per day for equipment costs, which include rental and mileage fees, and $153 a day for labor. Labor accounts for almost 66% of the total costs.

On the request of some users, the Business Services Department investigated the possibility of operating taxis from the Rad Lab to the campus, or increasing the frequency of bus service. In both cases, the Department felt the increased cost in operation was unjustified.

About 300 graduate students are employed at the Rad Lab on a part-time basis. These students have odd class schedules when compared to an 8 to 5 working day, and at the same time, they work at odd shifts at the Rad Lab. Some of these students did not want to wait around a half hour for the bus to shuttle them between the Lab and the campus.

On the other hand, the Rad Lab did not consider a graduate student worth enough until he got his degree to provide additional service. It therefore took the attitude of having graduate students adapt their class and working schedules to take advantage of the published bus timetables. However, at least one faculty member who made use of the service when a bus ran to the lab every 15 minutes no longer uses the service. He now drives.

The Rad Lab bus service is provided free of charge.

Another bus line operates between the Lawrence Hall of Science, Space Sciences Laboratory and the campus. These facilities are located farther up the hill than the Lawrence Radiation Laboratory. A bus operating from the campus to these facilities passes the south entrance to the Rad Lab, but it does not go into the Lab's extensive facilities.

The Space Sciences Laboratory and Hall of Science bus operates on a half-hour frequency 8 to 5:30 Monday through Friday. This service is provided by a Ford Econoline Van, which begins its trip at the Hearst Mining Circle and Campbell Hall on campus. This service is also provided free of charge, and it is available to anyone who wants to use it.

Within the facility, a radio-dispatched taxi system using 6-passenger sedans provides very satisfactory service. A person wishing to go from one place to another calls the dispatcher, states his name, where he is located, and where he wishes to go. The average wait for a taxi is about four minutes. A taxi will pick up to five people all going in the same general direction. If two people at one location call in and say they want to go in opposite directions, then two taxis will be dispatched to pick them up.

The success of this system depends upon a skilled dispatcher who knows the territory the vehicles cover extremely well, and who can assess demands for service as they come in to make most efficient use of the vehicles and minimum delay. The dispatcher working at the Rad Lab satisfies these conditions. She works at a large metal desk with a map overlay of the entire facility before her. The map shows buildings in three dimensions. Six magnets with identifying flags represent the locations of the six cabs. She also has a radio receiver, transmitter and speaker phone. This type of dispatching is almost identical to that done by Yellow Cab. The only difference, and a very major difference, is that a cab will pick up several different parties in the course of its route. The dispatcher must continually assess new demands for service to modify the routes of cabs in order to maximuze use of vehicles, minimize waiting time for patrons, and minimize overall time in transit.

Six six-passenger cars are used to provide the service. Each taxi handles about 18 passengers per hour. During peak periods, all six taxis operate at once. During slack periods, some drivers give other drivers breaks for coffee and lunch. No extra help is hired for the purpose of giving breaks. The drivers have to cover each other.

Table 20 below shows patronage and mileage figures for the taxi service since its inauguration in September 1964. An average of around 500 passengers is carried daily.

Table 20

Patronage and Mileage Figures of Rad Lab Taxi Service
(from memo dated January 14, 1969, by Warren Coolbaugh of Business Services Department)

date	radio calls	passengers	taxi miles
		(average per day)	
9/64 to 6/65	495	556	254
7/65 to 6/66	511	524	246
7/66 to 6/67	498	510	238
7/67 to 6/68	417	443	223
7/68 to 12/68	412	471	245

Cost of taxi operation runs about $244 per day as of July 1 this year. $143 of this figure goes for labor. The remaining $101 goes for equipment rental, six radios amortized over a 60 month period, fuel and maintenance.

Operation goes from 8 a.m. to 5 p.m. Monday through Friday. Service is provided free of charge.

This taxi service replaced an earlier shuttle bus service which used four buses operating continuously over a circular route within the facility. The taxi service is cheaper and provides superior service, according to Mr. Coolbaugh.

Other University Bus Services

In addition to the Radiation Laboratory service, the University Garage rents out vehicles for two other bus services.

One of these services connects the campus with the Richmond Field Station during weekdays. One bus provides this service. It leaves the campus first at 7:30 a.m. The next trip is at 9:10 a.m., and from then there is hourly service until the last trip from the campus at 4:10 p.m.

The other service connects the Main Library in the University with Fernwald-Smyth Residence Halls at the upper end of Dwight Way next to the School for the Deaf and Blind. One bus operates this service and provides a 20-minute headway from the Library between 7:45 a.m. and 10:30 p.m. This service only operates during the Fall, Winter and Spring Quarters when the residence halls are in operation.

PART III

APPENDICES

APPENDIX A

STUDENT'S T TEST FOR TABLE 2 DATA

Eastern Area data: mean as calculated in Table 2 = 2.23.

N	Sample result - Mean (X-M)	$(X-M)^2$
1	.84	.706
2	.77	.593
3	.77	.593
4	1.71	2.922
5	.15	.022
6	.78	.608
7	.38	.145
8	.63	.396
9	.37	.608
10	.08	.006
11	.15	.022
12	.08	.006
13	.38	.145
14	.26	.068
		$6.840 = \Sigma(X-M)^2$

Standard deviation $(\hat{s}) = \frac{\Sigma(X-M)^2}{N} = \frac{6.840}{14} = .486.$

For the T test, $t = \frac{M - m}{s}$,

where M is the mean of the sample results, m is the mean of the entire population, of which we hope M is a fair representation, and $s = \hat{s}/\sqrt{N-1} = .486/\sqrt{13} = .138.$

For a 95% confidence level, and 13 degrees of freedom, t = 2.160.
For a 99% confidence level, and 13 degrees of freedom, t = 3.012.

(These figures are taken from a standard t-distribution table.)

With these figures, we can find the limits of m at both 95% and 99% confidence levels:

95%: $\pm 2.160 = \frac{2.23-m}{.138}$

solving for m: $m = 2.23 \pm .30$
or $1.93 \leq m \leq 2.53$

99%: $\pm 3.012 = \frac{2.23 - m}{.138}$

solving for m: $m = 2.23 \pm .42$
or $1.81 \leq m \leq 2.65.$

Southern Area (South III) data: mean (M) as calculated in Table 2 =1.03.

N	Sample results minus mean (X-M)	$(X-M)^2$
1	0.10	.010
2	0.13	.017
3	0.10	.010
4	0.13	.017
5	0.84	.705
6	0.57	.325
7	0.10	.010
8	0.21	.044
		$1.138 = (X-M)^2$

Standard deviation ($\hat{s}$) = .142.

$$t = \frac{M - m}{s},$$

where $s = \hat{s}/\sqrt{N-1} = .142/\sqrt{7} = .0556.$

For a 95% confidence level, and 7 degrees of freedom, t = ± 2.365.
For a 99% confidence level, and 7 degrees of freedom, t = ± 3.499.
(These figures are taken from a standard t-distribution table).

With these figures, we can find the limits of m at both 95% and 99% confidence levels:

95%: $\pm 2.365 = \frac{1.03 - m}{.056}$.

solving for m: $m = 1.03 \pm .13$,
or $.90 \leq m \leq 1.16$.

99% $\pm 3.499 = \frac{1.03 - m}{.056}$.

solving for m: $m = 1.03 \pm .196$
or $.83 \leq m \leq 1.23$.

Thus we can say with 95% confidence that between 1.93% and 2.53% of the student population lives in eastern areas. Similarly, another .90% to 1.16% of the students live in southern areas, with the same degree of confidence (95%).

Combining these results, between 2.83% and 3.69% of the students live in the East Area and South Area III (95% confidence level).

At the higher level of 99% confidence, the range increases, reflecting a slightly greater degree of uncertainty. At this level, we can say between 1.81% and 2.65% of the students live in the East Area. Another .83% to 1.23% live in southern areas (South Area III).

Combining these results at a 99% confidence level, between 2.66% and 3.88% of the students live in the East Area and South Area III.

Assumbin a student population of 27,000, these figures result in:

95% level:	521 to 683	students in the East Area.
	243 to 313	students in South Area III.
	764 to 996	students in combined East Area and South Area III.
99% level:	488 to 715	students in the East Area
	224 to 332	students in South Area III.
	712 - 1047	students in combined East Area and South Area III.

APPENDIX B

COMMENTS ON BATS REPORT

The California State Legislature established the Bay Area Transportation Study Commission in 1963 to undertake a comprehensive study of urban transportation in the nine-county San Francisco Bay Area, and to prepare a master regional transportation plan.

Although the State Legislature created BATS, it provided no budget for its operation. BATS had to seek funds from other agencies which might be interested in a transportation study. It thus obtained funds from Federal, State and local transportation agencies. BARTD and ABAG contributed small amounts. The largest amounts came from the Federal government, with the U. S. Bureau of Public Roads contributing almost 60%.

BATS, as the Commission became known, released its report last May, 1969. Its conclusions basically stated that automobile usage would increase much faster than population growth, that the recommended expanded transit system would serve only to skim off excess traffic during commuter rush periods, and that many more freeways would have to be built to accommodate the rest of the traffic. Even then bottlenecks and congestion would still occur on some of these freeways.

BATS Methodology

BATS began with the development of a vast collection of data. Using aerial photographs, employment guides, traffic surveys, employment surveys and other sources, BATS determined where people lived, where they worked, where employment was located, what open land was available for development, and what constraints existed in regard to zoning and development of open land.

This information was collected not only for the nine-county Bay Area as a whole, but also was broken down by small geographical units called "Analysis Zones." BATS divided the whole Bay Area into 291 analysis zones. These are shown in Figure 1B.

But perhaps BATS placed even greater emphasis on collecting data revealing "trends." Population is growing much faster in outlying counties, particularly in Santa Clara County, than in the core counties. Manufacturing follows this trend, particularly the "new technology" manufacturing, which is developing heavily in Santa Clara County. But service and finance employment is growing more rapidly in relation to other employment, and this tends to concentrate in the core areas. Densities might greatly increase in the core areas, but there is nothing to indicate densities will increase in the bulk of the Bay Area. Outside of the core areas, almost all new dwelling construction has been in the form of private houses rather than multiple unit dwellings. Recent data indicates this trend might be changing, but BATS doesn't think the change in trend will be drastic. Personal income continues to rise, and auto usage increases with rises in personal incomes. Transit usage has declined, but not nearly as much in the Bay Area as elsewhere.

In deed, in certain commuter gateways there have been dramatic reversals of declining transit patronage. Transit patronage on the Bay Bridge increased more than 50% between 1959 and 1965, after years of uninterrupted decline. The bulk of transit trips are accounted for by work purposes; however, trips of a non-work nature are accounting for an ever-increasing proportion of trips being made. Prospects for longer weekends, shorter work hours, and more vacations indicate this trend will accelerate. Assuming that transit serves primarily commute trips to central CBD's, this means that transit's share of the total "trip market" will decrease in the future as more trips are accounted for by shopping and leisure purposes.

These are some of the trends over the past twenty years, together with much socio-economic information on population, that BATS fed into the computer. All of this information was analyzed by analysis zones.

With data collected on conditions during the base year of 1965 and trends evident at that time, BATS went to work making projections.

In making projections of Bay Area growth for 1980 and 1990, BATS first made assumptions about growth for the region as a whole, noting national trends and trends for the Bay Area. It then attempted to distribute this growth to each of the 291 analysis zones, so that BATS would be able to see what these zones would be like in 1980 and 1990. Once BATS knew this information, it could then decide what travel demand would be in those years.

Using condition and trend data for 1965, BATS first decided what new basic employment would come to the Bay Area, and where it would be located. Transportation facilities, geography, existing development and "trends" dictated where this basic employment would locate. For instance, "new technology" employment would grow greatly in Santa Clara County, while San Francisco and perhaps Oakland would draw even more heavily on financial and service employment.

With basic employment growth and location decided, BATS then decided where residential population by households would be located relative to basic employment. This information in turn determined where "population serving" employment would locate. A further model projected households into income categories and dwelling unit structure classes.

BATS assumed the "highest and best" use of the land would preempt other uses, unless planning policies or other restrictions interfered.

But the heart of the BATS study is a model to project travel demand. As explained in the body of this report (page 1) this model was partly built upon socio-economic characteristics of the population to predict travel generation throughout the Bay Area for the base year of 1965. It was also partly built upon gravity model principles to distribute this travel to different destinations.

Once this model was satisfactorily perfected for the base year of 1965, it was coupled to population, employment, income and distribution predictions for 1980 and 1990 to project travel demand and travel mode in those years. In

order to do this, further assumptions had to be made as to what travel facilities would be available during these years.

Comments

Two basic criticisms of the BATS report can be made. Neither is concerned with the study's underlying methodology, but with its assumptions which, in turn, led to the conclusions. The first criticism concerns BATS conservative conception of the role of transportation in land-use development. The second concerns BATS continuation of present transport programs into the future without testing the consequences of anything different.

In regard to the first, BATS recognizes that land-use development and transportation development are interdependent, but it assumes in its planning that all transportation in the future will be developed to serve projected land use. Transportation is not conceived of as a tool to guide land use development.

BATS itself states on page 5-17 of its report:

> "The premise is that transportation should be designed to serve land use, not to master it. Thus urban location forecasts tend not to be constrained by transportation barriers, at least not in the first round of planning."

But at the same time, the freeway network that BATS recommends not only will serve land use, but it will also master it to a degree. That BATS recognizes this is evident in a quote from page 7-1 of the report:

> "Freeways built in areas where greatly increased population, employment and travel time have been forecast are instrumental in attracting the urban activities which generate the traffic."

It seems, according to the quote, that the only reason greatly increased population and employment have been forecast for these particular areas is that freeways were planned for them!

BATS recognizes that with tight restrictions on available space and increasing urbanization, then a much greater emphasis on transit will be required (page 8-9). But increasing cries against freeways and against sprawl did not seem to indicate to BATS that that day might be now.

In light of the strong displeasure with freeways and sprawl in the Bay Area, it seems a pity that BATS did not test a plan of development and transportation which would have incorporated a system of permanent open space and extensive fixed-route high-quality transit for the Bay Area. Such a coupled system would have resulted in a different pattern of development with resulting differing travel demands on the transport facilities.

The Bay Area is not prepared to come to grips with this type of issue, BATS maintains (8-23), and perhaps this is so. But BATS did not even test a transit system of excellent quality designed to cope with the spread-out development it predicted. Instead, BATS just tested extensions of what we have today, as is stated on page 7-1 of the report:

> "The transportation systems analyzed in this chapter are generally based upon the continuation of transport programs and policies now in effect."

All of the transit networks analyzed were commuter-oriented designed to carry the excess crush of traffic primarily to San Francisco during rush hours. All of the freeways that BATS projected were designed to carry the millions of trips that this specialty-oriented transit network could not carry. BATS gives an example:

> "To illustrate, BARTD has ample capacity through the Caldecott Tunnel area where serious highway overloads are anticipated. A first reaction might be that the two would balance out--that trips would move from road to rail. Some of this will happen, of course, but the important question is, how much? To what extent is there a real option Involved are the time and purpose of vehicle trips and, most importantly, their origins and destinations: in short, identifying trips likely to continue to use the highway in any event because transit service does not fit their particular requirements (7-29)."

Even BATS most elaborate transit networks tested were just extensions of this basic system. All local service mentioned was done so in the light of feeder service to commuter lines. It did not test a system which would give region-wide mobility for all purposes by transit, and most particularly, it did not test such a system coupled to a highway system of limited future extension.

In light of the fact that BATS paid very close attention to planning restrictions on land use and open space, it seems surprising that it did not pay attention to such restrictions and popular pressure on freeways and their consequences. If it had done so, it would have actively sought out and tested possible alternatives to the automobile.

To show the advantages which the automobile afford, BATS cites a selection from the Spring 1967 issue of California, Magazine of Commerce, Agriculture and Industry:

> "A deep and lasting affinity has existed between the average California citizen and the automobile for many years. He seems to demand the independent mobility--the ability to go where he wants at his pleasure--that driving his own car provides, and he is more than willing to pay for it. He refuses to live in an environment that groups his home, place of work and shopping facilities all within easy walking distance of each other. He turns away from the use of mass transportation as a means of getting to work and even is reluctant to join in a car pool with fellow workers. He prefers to own at least two automobiles and for good reason. While he has one at work, the other is used by the rest of the family to transport the children to school and to permit his wife easy access to the thousand and one advantages and services that exist within the community--if she has convenient access to them (1-21)."

But at the same time it notes another trend, a rising recognition of the fantastic price that must be paid to accommodate the automobile.

In Berkeley the latter trend is well developed. It seems that at least some Berkeley residents, as well as some in other parts of the Bay Area, are saying that we have paid enough for the automobile. An environment worth living in is more important than keeping auto mobility fluid, and in order to make this area work, an alternate means is necessary. It would be desirable if this alternative offered the quality of mobility that the automobile can offer. On the other hand, a slightly lesser degree of mobility might be accepted if at the same time it is difficult to travel by automobile.

The vast array of BATS data concerned with travel patterns now collected could assist in formulating plans for increasing the effectiveness of alternatives to the automobile, both using what is now available in the form of A-C Transit, Muni and BART, and what might be available in the form of dial-a-bus and other new technologies. BATS models could then be used to test the effectiveness of these plans coupled with various highway plans in terms of patronage and area development.

The contribution that BATS has made in demonstrating a method of planning is potentially of great value; continuation of BATS studies with suitable modifications as the basis for transportation policy and planning in the Bay Area should be encouraged and supported.

Appendix C
Summary of Federal Guidelines
Pertaining to Transit Demonstration
Projects

¶ 4090 DEMONSTRATION GRANTS

The urban mass transportation program also assists states and local public bodies in testing and demonstrating new ideas and methods for improving mass transportation systems and services (.02).

These demonstration projects deal mainly with operational problems of mass transportation rather than with areas of planning or basic research. A demonstration project could cover the following work:

1. Changes in frequency and other service improvements;
2. Experiments in pricing policy;
3. Improvements in forms of mass transportation traffic flow;
4. Coordination of various modes or urban transportation service;
5. Testing new and improved technology;
7. Coordination of mass transportation with urban development.

Long-term capital improvements will not be financed through the demonstration program. At the conclusion of a demonstration, the residual value of any necessary capital improvements made with project funds must be deposited in the project account.

To insure that full benefits will be derived from the program, it is required that the project have competent professional direction and that complete records be kept during the operation. Consultants or research organizations may be used to observe or collect data from the project, or to analyze and report on such data (.04).

.02 Urban Mass Transportation Act of 1964, P. L. 88-365, Sec. 6, 78 Stat. 302 (1964), as amended. Text at ¶ 14,006.

.04 *Urban Mass Transportation Demonstrations,* Department of Transportation, Urban Mass Transportation Administration, July 1968, p. 1.

¶ 4090A ELIGIBLE PARTICIPANTS

A contract for a demonstration grant will be made only with a public agency or non-profit organization that has legal authority to undertake the project. Other public agencies and private organizations may participate in and contribute to the demonstration, but responsibility for contracting for such participation and for direction of the project, the proper use of grant funds and fulfillment of the contract conditions rests with the project sponsor.

The project sponsor may employ a staff specially recruited for the demonstration or it may assign, on a full-time or part-time basis, its own existing staff. However, no part of salaries of elected officials or appointed principal executives of a public agency may be charged to the project.

Consultants, public or private institutions, corporations, and others may be employed on a contract basis. All such third-party contracts must be submitted to the Department of Transportation for approval (.03).

.03 *Urban Mass Transportation Demonstrations,* Department of Transportation, Urban Mass Transportation Administration, July 1968, p. 1.

¶ 4090B CRITERIA FOR EVALUATION

Proposed demonstration projects will be evaluated by the Department of Transportation on the following general criteria:

1. *Specific Objective.* The project must have a well-defined objective which will add to existing knowledge or techniques of mass transportation and which, if successful, will contribute to the improvement of mass transportation in relation to total urban transportation.

2. *Applicability.* The knowledge or improved techniques expected from the project must be useful in solving important problems of urban transportation in other areas, rather than being limited to unique or highly-specialized problems in a particular locality.

3. *Community Planning.* Consideration will be given to: (a) the extent of existing comprehensive transportation planning in the demonstration area and the contribution of the demonstration in carrying out such planning, and (b) the probability that the demonstration project will fit into future long-range community development plans in areas where plans are not complete.

4. *Practical Benefits.* Ordinarily a demonstration project should be so planned that, if successful, it will continue as a useful feature on the community's transportation system.

5. *Estimated Cost and Non-Federal Contribution.* The scope and cost of the proposed project will be weighed in relation to the anticipated value of the results and to the total funds available for the program. The extent of the non-federal contribution to the project will also be taken into consideration.

6. *Professional and Technical Capacity.* The applicant must have the professional and technical capacity to carry out the proposed project effectively, or must have specific plans and arrangements to obtain such capacity in the event the project is approved.

7. *Geographic and Subject-Matter Diversification.* Each proposed project will be considered in the light of the contribution it could make to a total demonstration program covering as many aspects of mass transportation in as many geographic areas as possible (.05).

.05 *Urban Mass Transportation Demonstrations,* Department of Transportation, Urban Mass Transportation Administration, July 1968, pp. 2 and 3.

¶ 4090C SUBMISSION OF PROPOSAL

An agency which is considering applying for a mass transportation demonstration grant should first submit to the Urban Mass Transportation Administration, Department of Transportation, Washington, D. C. 20591, a proposal, in the form of a letter (original and five copies), giving the following information:

1. *Project Objective.* A concise statement of the purpose of the project, stated in terms of what the project is designed to demonstrate or test;

2. *Summary of Project Activities.* A concise statement describing what will be done to achieve the project objective, including: (a) how and where the demonstration will be conducted; (b) new methods or ideas which will be demonstrated; (c) changes to be made in existing services or facilities and new services or facilities to be provided; (d) participants, directly or by contract, in the project; (e) arrangements for data collection, analysis, and reporting; and (f) time schedule and summary of costs and sources of funds.

3. *General Applicability.* A concise statement on the significance of the expected results of the demonstration and how they can be useful in solving mass transportation problems in other urban areas.

4. *Applicant.* A concise description of the applicant, its organization and functions, and its relationship to other agencies concerned directly or indirectly with urban transportation matters in the locality.

5. *Legal Authority.* An opinion of counsel indicating the applicant's legal authority to undertake the project and accept a federal grant.

6. *Statement with Respect to Labor Requirements.* The Urban Mass Transportation Act of 1964 (.02) requires that equitable arrangements be made, as determined by the Secretary of Labor, to protect the interests of employees affected by the federal grant assistance, and that the grant contract must specify the terms and conditions of the arrangements. Information concerning this requirement may be obtained from the Assistant Secretary of Labor for Labor-Management Relations, Washington, D. C. 20210 (.04). See also ¶ 9331.

.02 Urban Mass Transportation Act of 1964, P. L. 88-365, Sec. 13(c), 78 Stat. 302 (1964), as last amended by P. L. 90-448 (1968). Text at ¶ 14,013.

.04 *Urban Mass Transportation Demonstrations,* Department of Transportation, Urban Mass Transportation Administration, July 1968, p. 2.

¶ 4090D FORMAL APPLICATION

After review of the initial proposal, the Department of Transportation will notify the applicant whether or not a formal application should be submitted. A formal application should not be submitted until so requested (.08).

.08 *Urban Mass Transportation Demonstrations,* Department of Transportation, Urban Mass Transportation Administration, July 1968, p. 3.

¶ 4090E FINANCING

To finance urban mass transportation research, development and demonstration projects, the law provides that the administration of the program may use the urban mass transportation authorizations (see ¶ 4079) up to a limit of $40 million in fiscal year 1968 and $56 million in 1969. However, on or after July 1, 1969, the Secretary of Transportation may use such additional funds out of the program authorizations as he deems appropriate (.04).

.04 Urban Mass Transportation Act of 1964, P. L. 88-365, Sec. 6(c), 78 Stat. 302 (1964), as last amended by P. L. 90-448 (1968). Text at ¶ 14,006.

¶ 4091 RESEARCH AND DEVELOPMENT PROJECTS

To help develop new knowledge and technology essential to future advances and their effective use in urban mass transportation, the program administration may carry on research and development programs either directly or by contract.

The research might explore theoretical and practical problems of urban mass transportation and may include activities to:

1. Develop design concepts for new and urban transit systems;
2. Test theories about the functioning of existing systems;
3. Ascertain public preferences in transportation;
4. Develop criteria for allocation transportation resources;
5. Inquire into legal, financial, engineering and esthetic aspects of urban transportation (.04).

.04 *Urban Technology and Research,* HUD-IP-77, October 1967.

¶ 4091A GRANTS FOR TECHNICAL STUDIES

The law (.02) authorizes a program of grants to assist public agencies in making technical studies to improve mass transportation service in urban areas. The basic purpose of this program is to bridge the gap between federally assisted transportation planning of an overall nature and federally assisted capital investments in mass transportation facilities and equipment. Accelerated progress in providing needed urban mass transportation facilities is the expected result.

Under the technical studies program, the Department of Transportation is authorized to make grants to states and local public bodies and agencies to plan, engineer, and design urban mass transportation projects. The technical studies and the projects themselves must relate to a program for the unified